EXHIBIT E: REPORT OF MEASUREMENTS [2.1033(B6)]

Test Report for FCC ID: CB2070AHL4

FCC Part 2.1031, Part 15 Subpart C(15.231)

Report 0801088F
Issued 03/25/08

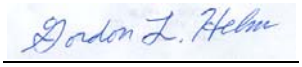
TRANSCEIVER MODEL CB2070NHL4 OF HOMELINK® IV SERIES

Judgment: See summary

Prepared for: Mr. Christopher Plank
Johnson Controls Interiors, LLC
One Prince Center
Holland, MI 49423

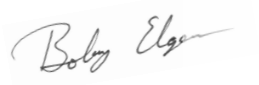
Test Date(s): January 16-18, 2008

data recorded by



Gordon Helm, NCE
Lab Manager

witnessed by



Bolay Elgersma
JCI Representative

This report prepared by:

Gordon Helm, NCE
Lab Manager

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Statements Concerning this Report

NVLAP Accreditation: NVLAP Lab Code 200129-0
The scope of AHD accreditation is the conducted emissions, radiated emissions test methods of:

IEC/CISPR 22: Limits and methods measurement of radio disturbance characteristics of information technology equipment.
FCC Method – 47 CFR Part 15 – Digital Devices.
AS/NZS 3548: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment.

Test Data:
This test report contains data covered by the NVLAP accreditation.

Subcontracted Testing:
This report does not contain data produced under subcontract.

Test Traceability:
The calibration of all measuring and test equipment and the measured data using this equipment are traceable to the National Institute for Standards and Technology (NIST).

Limitations on results:
The test results contained in this report relate only to the Item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require an evaluation to verify continued compliance.

Limitations on copying:
This report shall not be reproduced, except in full, without the written approval of AHD.

Limitations of the report:
This report shall not be used to claim product endorsement by NVLAP, FCC, or any agency of the US Government.

Statement of Test Results Uncertainty: Following the guidelines of NAMAS publication NIS81 and NIST Technical Note 1297, the Measurement Uncertainty at a 95% confidence level is determined to be: +/-1.4 dB

Manufacturer/Applicant [2.1033(b1)]

The manufacturer and applicant:

JOHNSON CONTROLS INTERIORS, LLC.
One Prince Center
Holland, Michigan 49423

Product Description [2.1033(b4)]

Purpose
Remote control device for managing the operation of garage doors, estate gates, lighting, and similar systems.

Feature(s)
This product can replace up to three remote control devices. This feature is realized by the product's ability to "learn" the bit-code format and transmission carrier frequency of another remote control. Once learned, the product retransmits this code using the appropriate carrier frequency when commanded by the user.

Product Labeling
The FCC Identifier assigned is FCC ID: CB2070AHL4. The Industry Canada certification number is 279B- 070AHL4. These identifiers will be labeled on the product housing.
The label will be placed on the exterior of the HL4 housing using an acrylic adhesive that will permanently affix the label.

Technical
These are the technical considerations relevant to compliance requirements.

1. Remote control is affected through radio frequency (RF) transmission over four carrier frequency ranges: a) 286 – 303.5MHz; b) 307.5-321 MHz; c) 336.4 – 398.9 MHz; d) 411 – 450 MHz. The frequencies tested are 288, 310, 340, 365, 390, and 433MHz
2. An on-board single-conversion super heterodyne receiver with intermediate frequency (IF) of 10.7 MHz is active during the learning mode. This local oscillator activity was measured during the spurious measurements.
3. The central processing unit operates from a 20MHz clock.
4. Antenna tuning for receive and transmit modes is implemented through a proprietary process that includes the application of a series of pulses to the antennas.
5. The RF power output is a function of the bit-code format's duty cycle and carrier frequency. This allows RF power levels to be adjusted with respect to the emissions limits that are also a function of frequency and duty cycle.

Because of the small size of the device and because the installation is inside a portion of the automobile, the following statements will appear in the user's manual. Refer to attachment "user_ man. pdf" for the entire text of the user's manual.
"This device complies with Part 15 of the FCC rules and with RSS- 210 of the Industry Canada. Operation is subject to the following two conditions:
This device may not cause harmful interference,
This device must accept any interference that may be received including interference that may cause undesired operation.
WARNING: The transmitter has been tested and complies with FCC and Industry Canada rules. Changes or modifications not expressly approved by the party responsible for
the compliance could void the user's authority to operate the device."

Measurement/Test Site Facility & Equipment

Test Site [2.948, 2.1033(b6)]

The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 M-152, Dowagiac, Michigan 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC and Industry Canada. The original report filed with the FCC is, dated November 5, 1996, was accepted by the FCC in a letter dated January 15, 1997 and reconfirmed July 14, 2000, (31040/SIT 1300F2). The original report filed with Industry Canada, dated August 11, 1998, was accepted via a letter dated September 1, 1998, (file:IC3161).

Measurement Equipment Used [2.947(d), 15.31(b)]

Measurement Equipment Used

Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	21-June-07	12 months
RF Receiver Section	HP-85462A	3625A00342	21-June-07	12 months
EMCO BiconiLog Antenna	3142	1069	30-Aug-07	12 months
Solar LISN	8012-50-R-24-BNC	962137	30-Aug-07	12 months
Solar LISN	8012-50-R-24-BNC	962138	30-Aug-07	12 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	05-Mar-08	12 months
(3-m) LMR-400 Ultra Flex	LMR400	9812-11	09-Nov-07	6 months
(3-m) CS-3227 RG8	CS-3227	C060914	09-Nov-07	6 months
(10-m) Amelco 50ohm Coax	RG213U	9903-10ab	09-Nov-07	6 months
Double Ridged Horn	ONO91202-2	A00329	calibration by design & physical inspection.	
Wienschel Attenuator	200099	8950	05-Mar-08	12 months
AJFW Attenuator	50HF	803	05-Mar-08	12 months
EMCO Loop	6502	2148	01-Sept-06	36 months
Keytek Surge	711B	8511854	05-Mar-08	12 months
Schaffner ESD	NSG432	01027	02-Mar-08	12 months
HP Oscilloscope	54100D	2510A00511	07-Jan-08	12 months
Tektronix HV Probe	P6015	1324A1012	07-Jan-08	12 months

Measurement Environment

The tests were performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 19^{o} C., the relative humidity 35%.

Tested Configuration /Setup: [2.1033(b8)]

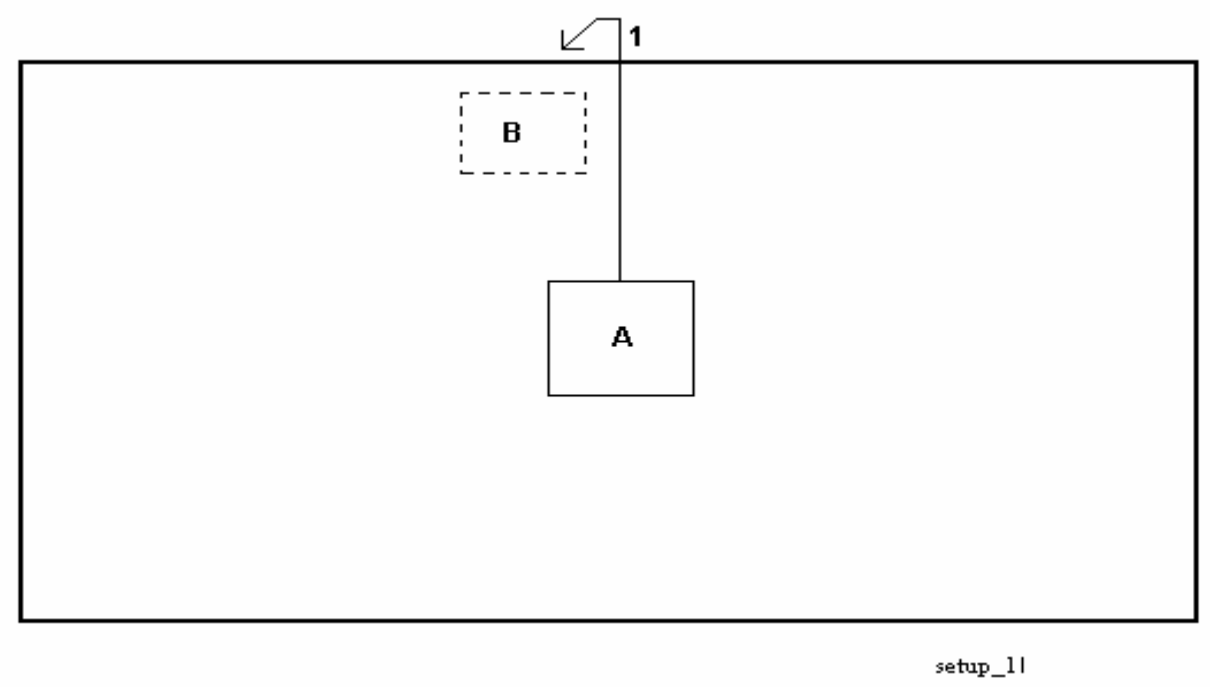
Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] Universal Garage Door Opener	[JCI] 070NHL4	1562933C1831	FCC ID: CB2070AHL4
	HL4 PCB		--	
B	12V DC Power Supply	[Trygon] DL40-1	7968152	Located on the turntable base below the EUT table.
1	Power Supply Cable Harness	--	--	1.5 meters, Unshielded, 2-lead lightly twisted cable harness.

Setup Picture

Note: Setup photographs are located in Attached Electronic File, Exhibit C.

Setup Diagram



BASIC EUT SETUP
(Legend designation is above)

Summary of Results:

1. This test series evaluated the Equipment Under Test to FCC Part 15, SubPart C.
2. The equipment under test was received on January 16, 2008 and this test series commenced on January 16, 2008. Preliminary tests had been performed December 2007.
3. The line conducted emission testing does not apply to this product. The device is powered from a 12 volt automobile source.
4. The frequencies selected for final evaluation include 288MHz, 310MHz, and 433MHz. This is in accordance with 47 CFR 15.31(m). The 310MHz was selected as a mid-range frequency because it is the predominant frequency used in controlling garage doors. Past correspondence with the FCC regarding the selection of frequencies and test setup suggest this judgment as appropriate.
5. Occupied Band Width of the transmitted signal, at the 20dB point, nearest the limit was measured to be 443kHz. This measurement occurred with the EUT transmitting at 288MHz with a pulse modulation of 30% duty cycle. This measurement is within the allowed 720KHz bandwidth. The greatest value of occupied bandwidth was measured to be 654kHz. This bandwidth was measured with the EUT transmitting at 433MHz.
6. The preliminary scan for spurious emissions conducted in a shielded room indicated very low level spurious signals.
7. The digital spurious emissions listed as suspects were all at or below the area ambient signals. The rf noise floor of a suspect signal area nearest the limit, occurred at 95.4MHz. The quasi-peak level was measured to be 29.6dBuV/m which is 13.9dB below the FCC Class B limit.
8. The evaluation of the field strength levels of the harmonics showed the emission nearest the limit occurred while operating at 287MHz with 500Hz pulsed modulation at 30% duty cycle. The EUT was configured in the ‘flat’ position, and the receive antenna oriented in the vertical polarization. This signal, at 576MHz, was measured to be 5.3dB below the average limit of 53.8dBuV/m.

9. The average value, nearest the limit, of the fine tune pulses over a 100mSec time occurred while operating at 288MHz. The average measurement was determined to be below the data level.

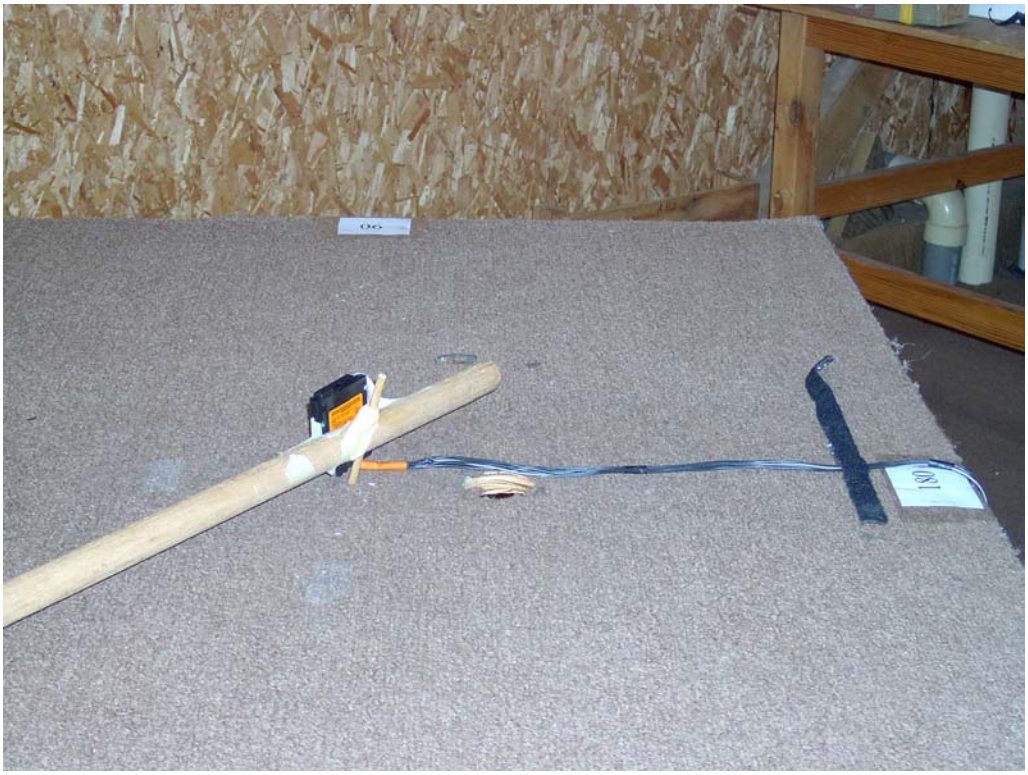
10. The learn mode was evaluated with spurious emissions, but due to a firmware limit which caused it to transmit at 310MHz, the Local Oscillator could not be measured.

11. The system tested is compliant to the requirement of CFR 47, FCC Part 15, SubPart C for periodic operation in the allowed frequency bands above 70MHz, (Part 15.231).

12. Voltage variation test result in the range of 6-20VDC varied from the 12VDC typical by +0.5dB at
8VDC and -0.1 dB at 14VDC. Transmission stopped at 6 and 20VDC.

13. There are measurements for two of the six bands that exceed the limits as measured by ANSI C63.4, but may be compliant; "JCI has presented a letter (included as “FCC harness letter_001.pdf”) from Ed Gibbons of clarification or exception from the FCC dated June 13, 1995 that suggests the product is compliant with 47 CFR 15.31(m)". In an automobile the RF power variations which are extensive and JCI did not supply a test setup to allow for this in testing the power output. From AHD’s point of view, their design spec is to accept these RF power conditions and this would very likely have an impact on RF output levels.

AHD’s opinion was that these two bands needed to be reduced further.
ANSI requires that the peak be found in all orientations. This includes measurements in three orthogonal orientations. JCI’s opinion of the FCC letter is that off axis measurements are not to be taken. This is considered to be harness manipulation by JCI. The 2-wire harness remained fixed and only the EUT was rotated in the center of the table. The following picture shows the off axis measurement of the peak fundamental emission:



The results are in the list that follows for either conclusion from the letter:
By JCI's test plan; the field strength level of the fundamental was measured for 288MHz, 310MHz, and 433MHz. The evaluation showed the emission nearest the limit occurred while operating at 288MHz with 500Hz pulsed modulation at a 50% duty cycle. The EUT was positioned on the 'side' and the receive antenna oriented in the horizontal polarization. This signal was measured to be 1.70dB below the average limit of 73.8dBuV/m (4,917uV/m).

By AHD's test plan; the field strength level of the fundamental was measured for 288MHz. The evaluation showed the emission nearest the limit occurred while operating at 288MHz with 500Hz pulsed modulation at a 50% duty cycle. The EUT was positioned on the 'side' and the receive antenna oriented in the horizontal polarization. This signal was measured to be 0.70dB above the average limit of 73.8dBuV/m (4,917uV/m).
By AHD's test plan; the field strength level of the fundamental was measured for 310MHz. The evaluation showed the emission nearest the limit occurred while operating at 310MHz with 500Hz pulsed modulation at a 50% duty cycle. The EUT was positioned on the 'side' and the receive antenna oriented in the horizontal polarization. This signal was measured to be 2.70dB above the average limit of 75.3dBuV/m.

Changes made to achieve compliance

1. Register settings:
   a.) 288MHz 0CF1
   b.) 310MHz 0CF1
   c.) 340MHz 0CF1
   d.) 365MHz 0EEF
   e.) 390MHz 0EEF
   f.) 433MHz 0EEF

Standards Applied to Test: [2.1033(b6)]

ANSI C63.4 - 1992, Appendix I
CFR47 FCC Part 2, Part 15, SubPart C, 15.231 Intentional Radiator; SubPart B, Digital Device
Public Notice DA 02-2850

Test Methodology: [2.1033(b6)]

The pictures in this report, showing test setups, indicate the agreed upon configuration of testing for this product-type.

For the testing, the EUT was installed in the plastic enclosure used in the overhead automotive configuration for which it has been designed. The system was placed at the center of the table 80cm above the ground plane pursuant to ANSI C63.4 for stand-alone equipment. The 12volt supply harness was routed to the edge of the long side of the table then down to the power supply located on the turntable base.

The line conducted emission testing was not performed on this product. In its final configuration the product is powered from an automobile 12 volt system only.

Radiated

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm above the open field site ground plane in the prescribed setup per ANSI C63.4, Figure 9(c).

The table sits upon a remote controlled turntable. The receiving antenna, located at the appropriate standards distance of 3 or 10 meters from the table center, is also remote controlled.

The principle settings of the EMI Receiver for radiated testing include:

IF Bandwidth: 120KHz for frequencies less than 1GHz.
1 MHz for frequencies greater than 1GHz.

Detector Function: Peak Mode
The Average levels were determined mathematically based upon the duty cycle of the pulsed modulation of the transmitted signal.

At frequencies up to 1000MHz a BiconiLog broadband antenna was used for measurements.

At frequencies above 1000MHz a double-ridge Horn broadband antenna was used for measurements.

During the evaluation the EUT was transmitting continuously.

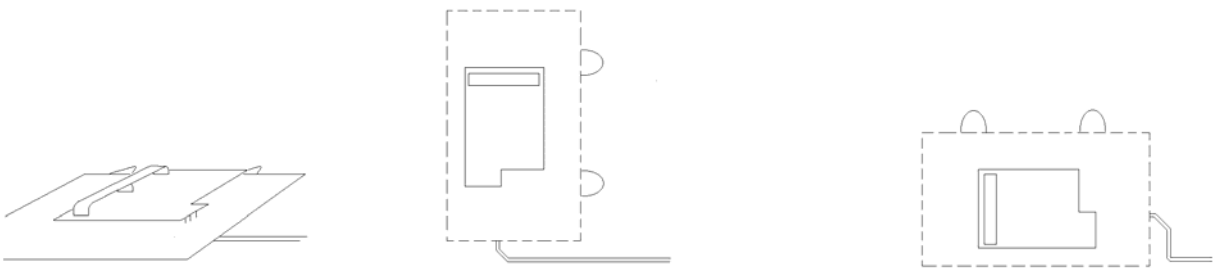
The turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions.

Preliminary tests were done at 288MHz, 310MHz, 340MHz, 365MHz, 390MHz, and 433MHz. The final measurements were made at a low band frequency (288MHz), a mid band frequency (310MHz), and a high band frequency (433MHz) pursuant to the requirements of 47CFR 15.31(m). At each frequency the EUT was placed in three orthogonal positions. At each position the 500Hz pulse modulation was adjusted to a 30%, 50%, and 80% duty cycle. At each duty cycle, measurements were taken with the receive antenna in vertical and horizontal positions.

The unit was evaluated up to the tenth harmonic of the fundamental as an intentional radiator, and up to 1000MHz as a digital device.

The orthogonal positions of EUT are:

Flat Side End



FORMULAS AND SAMPLE CALCULATIONS:

THE HP8546A EMI Receiver has stored in memory the antenna and coax correction factors used in this test. The resultant Field Strength (FS) in dBuV/m presented by the HP8546A is the summation in decibels (dB) of the Received Level (RF), the Antenna Correction Factor (AF), and the Cable Loss Factor (CF).

Formula 1: FS(dBuV/m) = RF(dBuV) + AF(dB/m) +CF(dB)

The resultant Field Strength measurement is recorded using the peak hold detector of the HP8546A.

This recorded peak level is further corrected, by calculation, to an average level by a factor determined by the duty cycle of the pulsed modulation. The duty cycle factor is determined as outlined in Appendix I4 of the standard ANSI C63.4:1992.

Formula 2: Average Level(uV/m) = [Peak Level(uV/m)] x [duty cycle factor].

Formula 2a: Average Level(dBuV/m) = Peak Level(dBuV/m) + duty cycle factor(dB).

The duty cycle factor to apply is determined for the duty cycles of 30%, 50% and 80% as follows.

For 30% (0.30): duty cycle factor(dB) = 20*Log(0.3) = -10.46
For 50% (0.50): duty cycle factor(dB) = 20*Log(0.5) = -6.02
For 80% (0.80): duty cycle factor(dB) = 20*Log(0.8) = -1.94

As an example:

A measured peak level of 50% duty cycle pulse modulated signal is 500uV/m.
Calculated to dBuV/m is 20*Log(500) = 53.98dBuV/m Peak level.
Applying the duty cycle factor: Avg. Level(dBuV/m) = 53.98 - 6.02dB = 47.96dBuV/m.

Calculation of FCC limits Part 15.231

For the frequency range 260MHz - 470MHz, the limit is a linear interpolation between 3750uV/m and 12500uV/m where the limit at 260MHz is 3750uV/m and the limit at 470MHz is 12500uV/m.

A formula to calculate the limit is established with a ratio linearly equating the frequency range to the limit range.

$(F_0 - F_L) / (F_H - F_L) = (L_0 - L_L) / (L_H - L_L)$

where F_0 and L_0 represent the frequency in question and its limit
where F_L and L_L represent the lower frequency (260MHz) and its limit (3750uV/m).
Where F_H and L_H represent the higher frequency (470MHz) and its limit (12500uV/m).

The calculations for the frequencies included in the application are:

288MHz (288 - 260) / (470 - 260) = (L_0 - 3750) / (12500 - 3750)
(28 / 210) * (8750) = L_0 - 3750
L_0 = 1166.7 + 3750
L_0 = 4916.7 uV/m is LIMIT at 288MHz

310MHz (310 - 260) / (470 - 260) = (L_0 - 3750) / (12500 - 3750)
(50 / 210) * (8750) = L_0 - 3750
L_0 = 2083.3 + 3750
L_0 = 5833.3 uV/m is LIMIT at 310MHz

433MHz (433 - 260) / (470 - 260) = (L_0 - 3750) / (12500 - 3750)
(173 / 210) * (8750) = L_0 - 3750
L_0 = 7208 + 3750
L_0 = 10958 uV/m is LIMIT at 433MHz

The limit in dB terms is calculated as the result of 20 times the log of the uV/m limit.

288MHz dB limit is 20 * LOG(4916.7 uV/m) = 73.8 dBuV/m

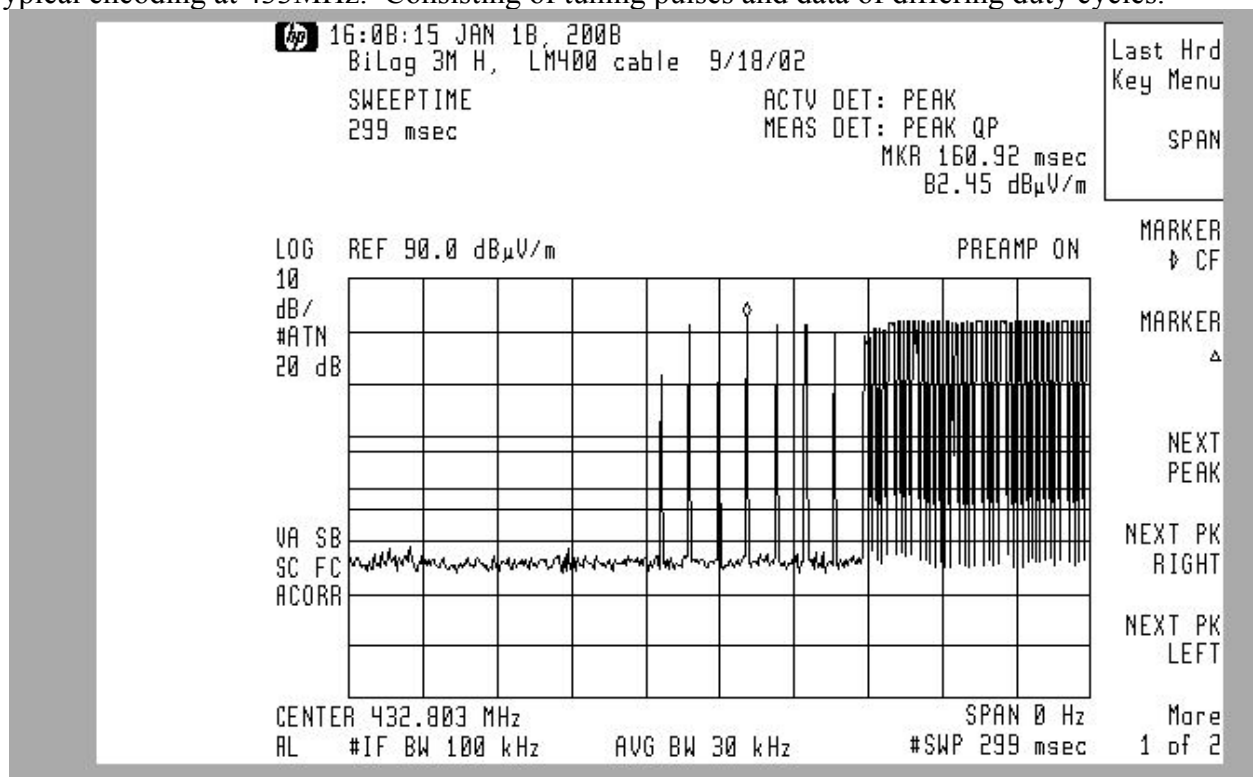
310MHz dB limit is 20 * LOG(5833.3 uV/m) = 75.3 dBuV/m

433MHz dB limit is 20 * LOG(10958 uV/m) = 80.8 dBuV/m

Test Data [2.1033(b6)]

Modulation Characteristics

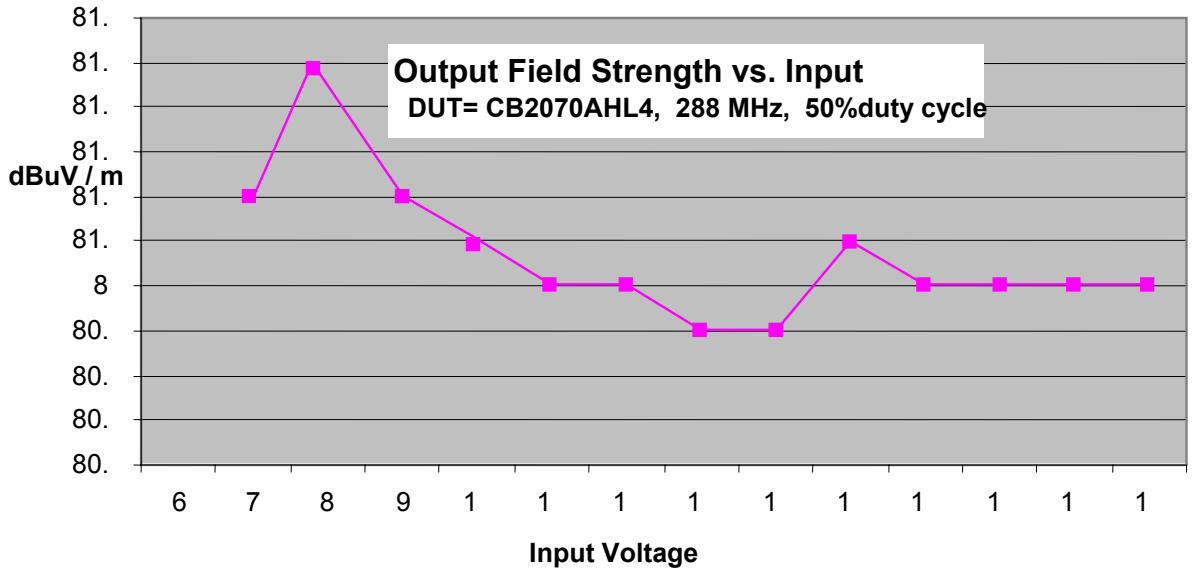
Typical encoding at 433MHz: Consisting of tuning pulses and data of differing duty cycles.



Relative Emission Level vs. Supply Voltage [15.31(e)]

The relative emission level as the supply voltage varied is presented in the table and plot below..

Output field strength vs Supply Voltage DUT= CB2070AHL4, 288 MHz, 50%duty cycle	
Volt In	TX OutPut Pk dBuV/m
6	NoOp
7	81.2
8	81.5
9	81.2
10	81.1
11	81.0
12	81.0
13	81.0
14	80.9
15	80.9
16	81.1
17	81.0
18	81.0
19	81.0
20	NoOp



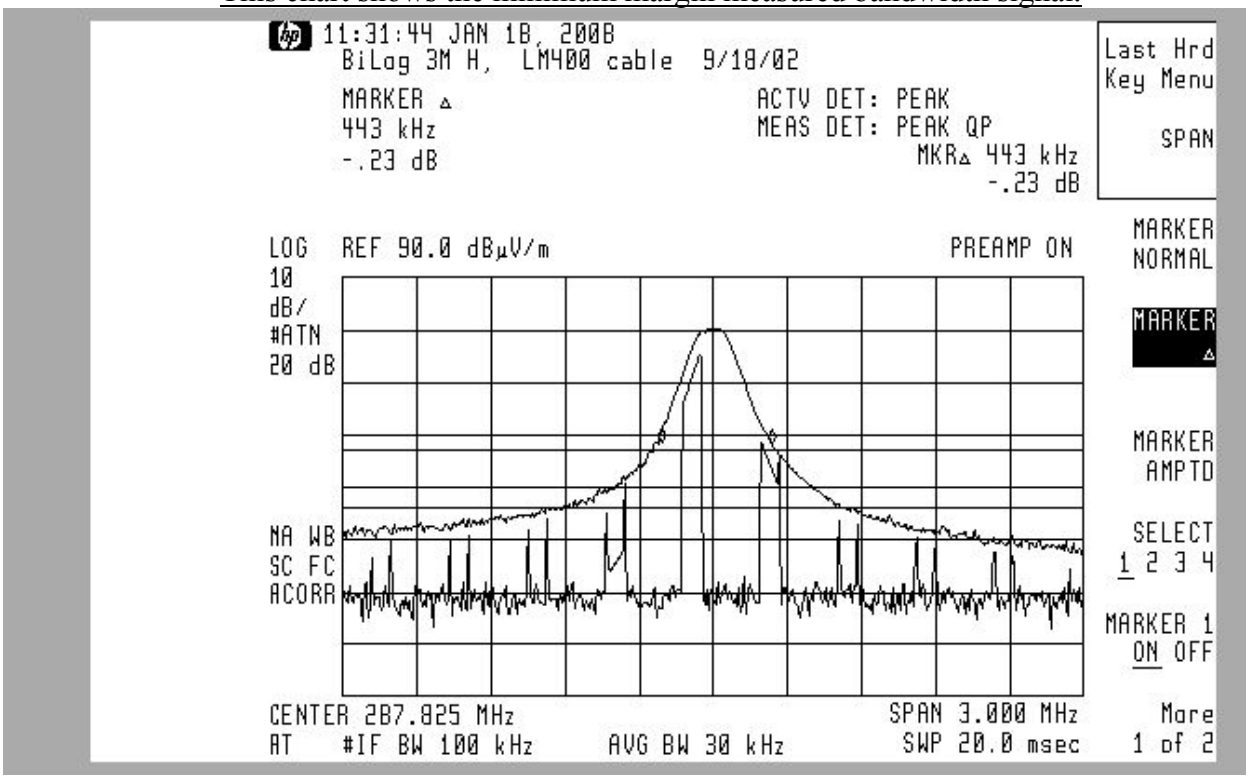
Occupied Bandwidth [15.231(c)]

The maximum allowed 20dB bandwidth is determined pursuant to 15.23(c). For fundamental signals between 70MHz and 900MHz the bandwidth allowed is 0.25% of the fundamental.

Formula 2: Allowed bandwidth = [Fundamental] x [.0025]

Fundamental (MHz)	Duty Cycle	Measured 20dB Bandwidth	LIMIT Fundamental * .0025	Margin
288	30%	443 kHz	720 kHz	277kHz
"	50%	413 kHz	720 kHz	307kHz
"	80%	398 kHz	720 kHz	322kHz
310	30%	398 kHz	775 kHz	377kHz
"	50%	398 kHz	775 kHz	377kHz
"	80%	390 kHz	775 kHz	385kHz
433	30%	450 kHz	1082 kHz	632kHz
"	50%	428 kHz	1082 kHz	654kHz
"	80%	450 kHz	1082 kHz	632kHz

This chart shows the minimum margin measured bandwidth signal.



Restricted Bands: [15.205]

The following frequency bands are restricted. Only spurious emissions are permitted at levels limited by 15.209:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.25
0.490-0.510	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

LIMIT @ 3meter: [15.209(a)]

30-88MHz	100uV/m	40dBuV/m
88-216MHz	150uV/m	43.5dBuV/m
216-960MHz	200uV/m	46dBuV/m
above 960MHz	500uV/m	54dBuV/m

Verification of no capability to tune within the Restricted Bands.

The unit is designed capable of tuning from 288MHz to 433MHz except that the Homelink® IV firmware prevents the possibility of tuning to the restricted regions of 322-335.4MHz, 399.9-410Mhz, and the region 304-307MHz where the second harmonic would be 608-614.

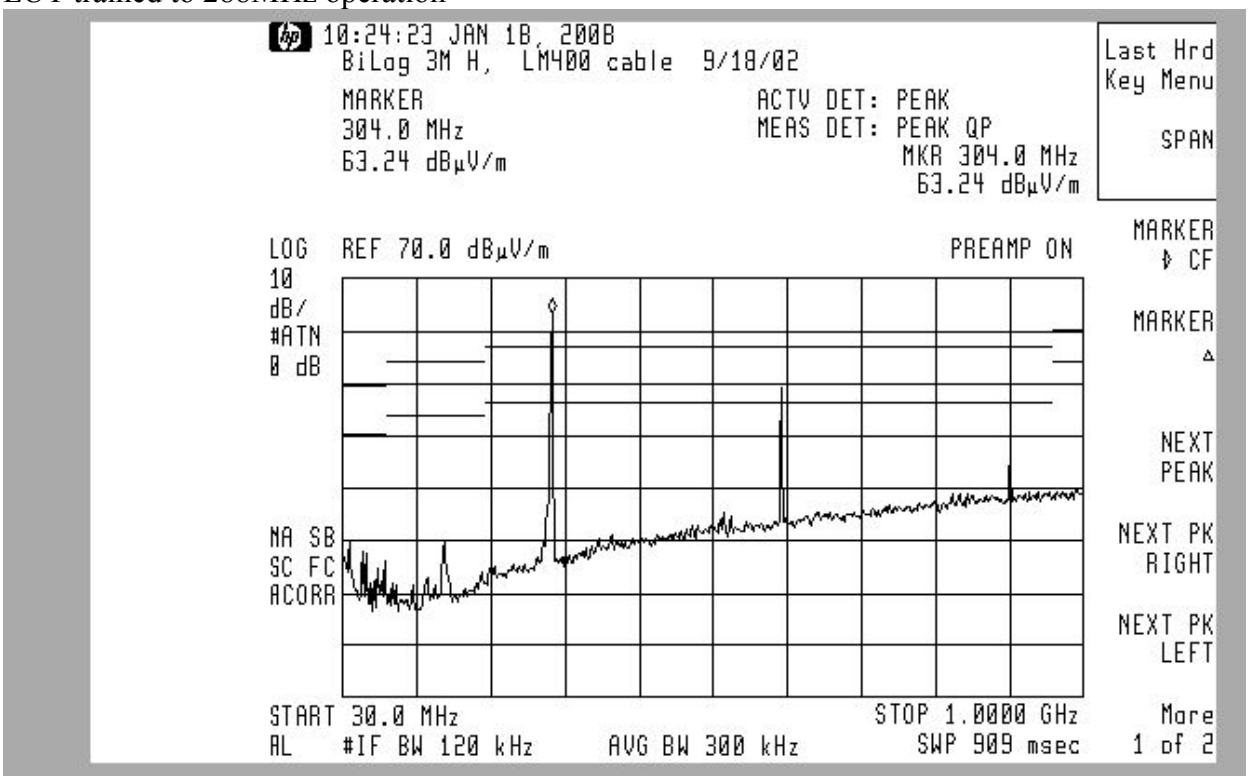
The spurious emissions observed in the restricted bands did not exceed the allowed limits for the restricted bands.

Radiated Field Strength Measurements: [15.231(b), 15.205]

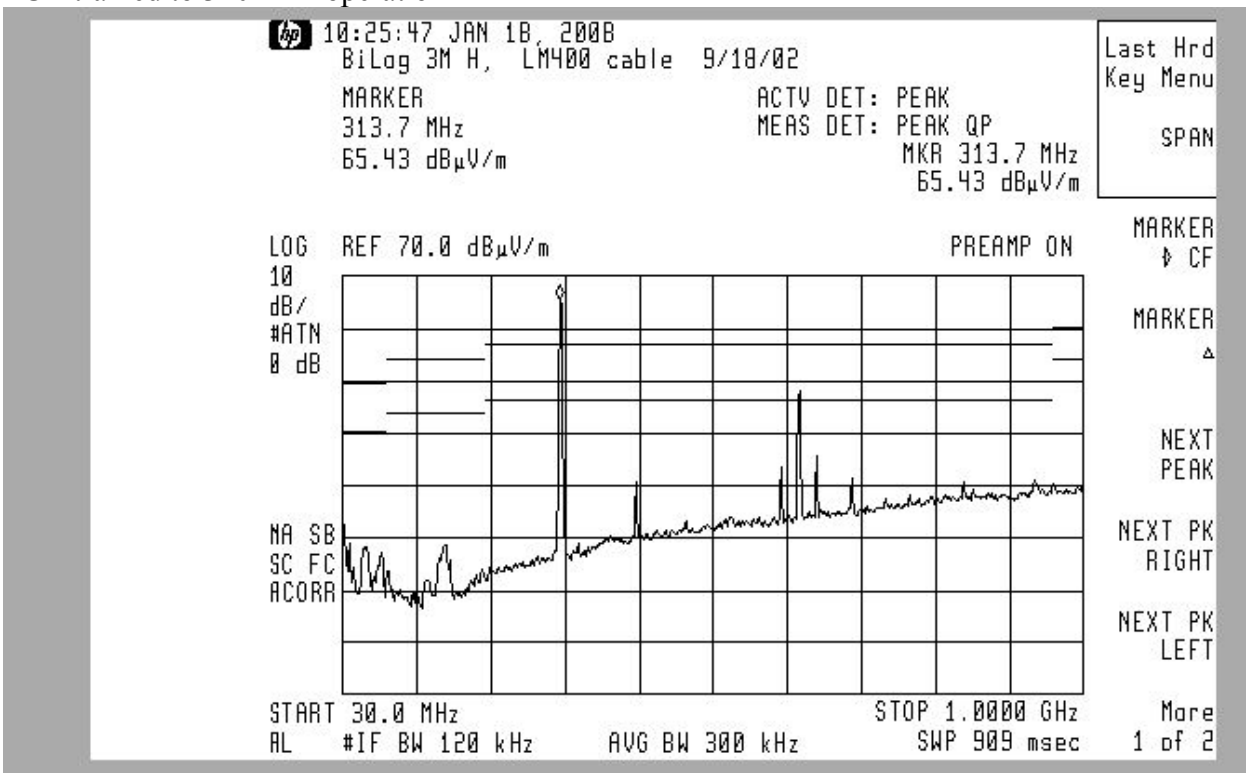
A scan of the 070NHL4 was made in a shielded room to study the emission profile of the EUT. These scans indicate there are low level spurious emissions from the unit other than the fundamental and its associated harmonics. The last scan is for the local oscillator while in receive mode. These suspect signals were measured at the 3-meter open area test site.

The first series of charts show the spectrum pattern of the EUT emissions. The levels indicated are not calibrated levels. Following the charts is a table of the measured levels at the 3-meter OATS.

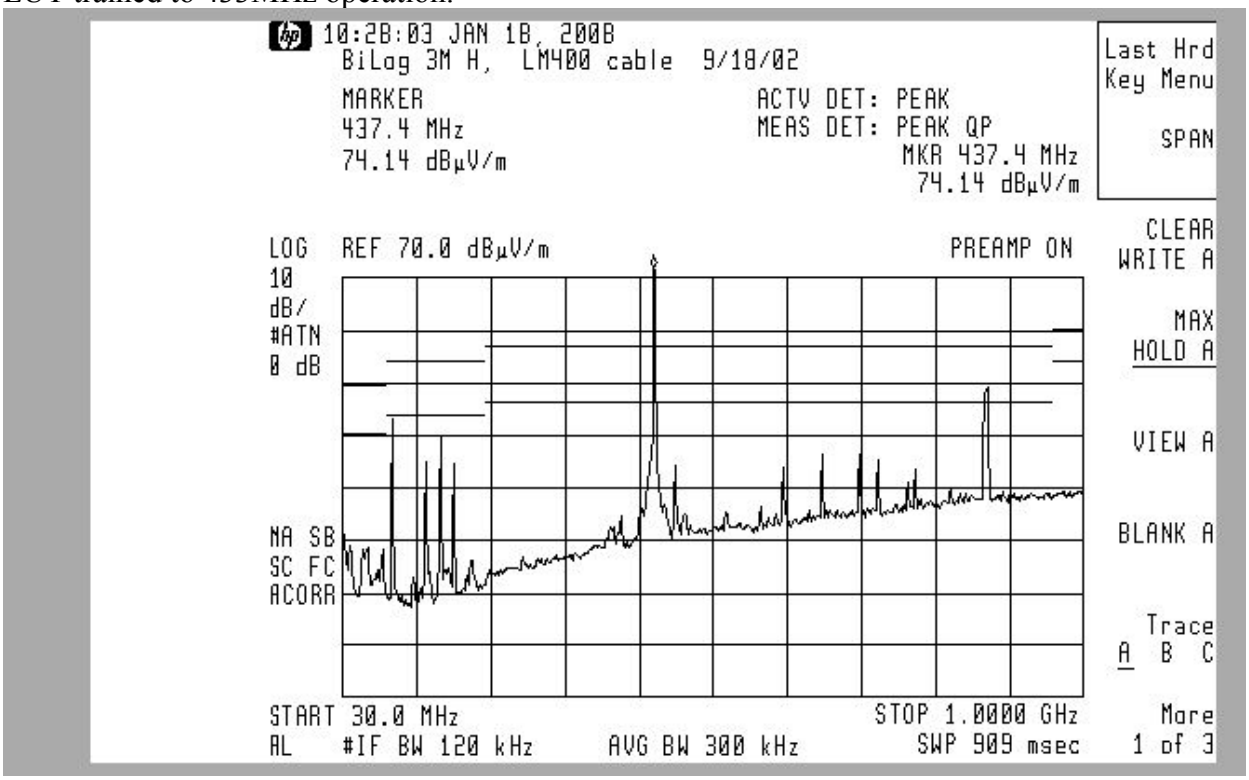
EUT trained to 288MHz operation



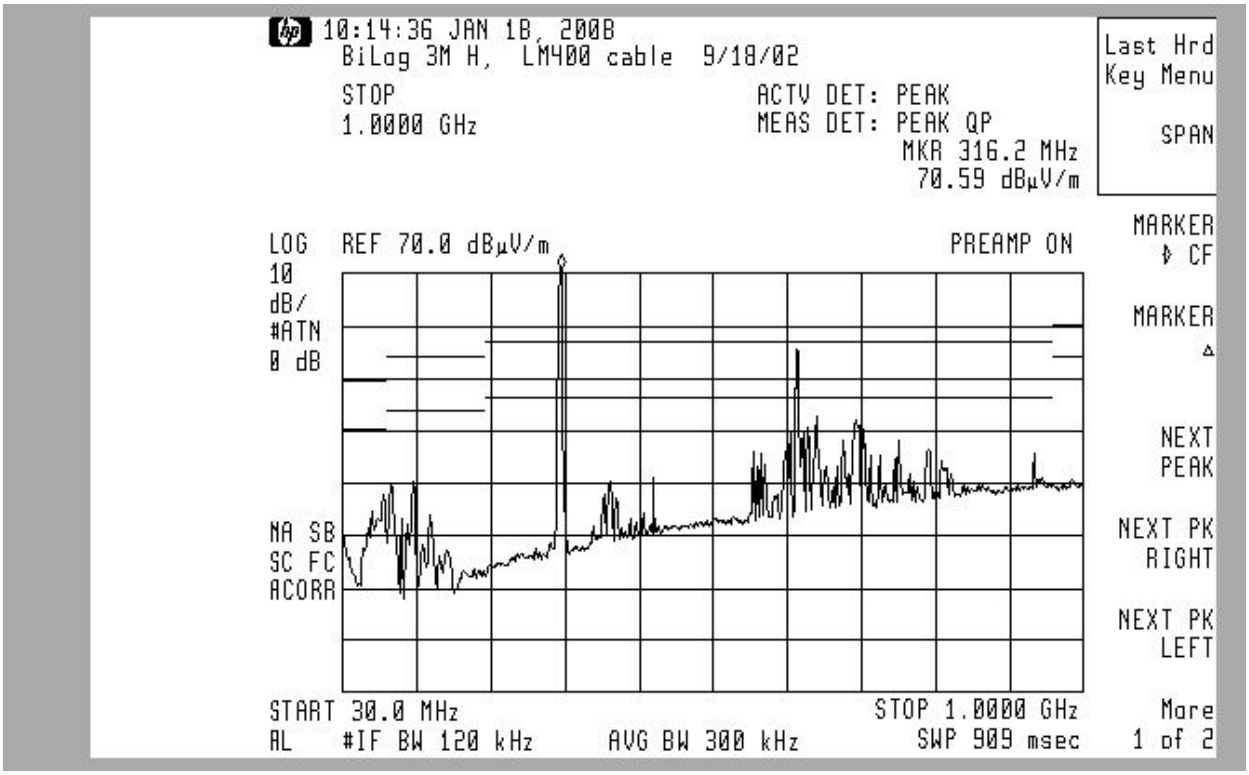
EUT trained to 310MHz operation



EUT trained to 433MHz operation.

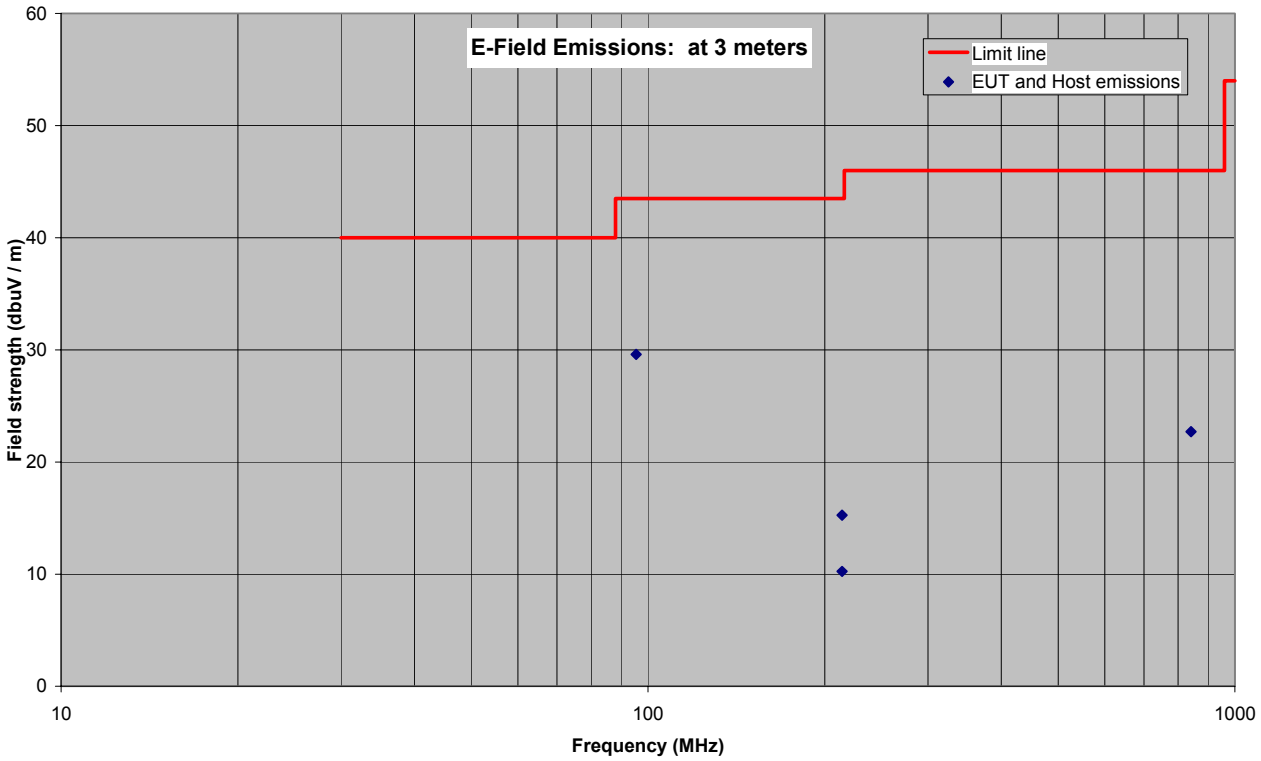


EUT in receive mode.



Radiated Field Strength Measurements

Spurious Data Graph of Quasi-Peak Measurements



Spurious Data Tabulated Quasi-Peak Measurements.

Frequency MHz	Polarity	Quasi Peak Measurement dBuV/m	FCC Class B Limit dBuV/m	Margin dB		Included Cable + Antenna Factors dB/m
95.4525	V	29.59	43.50	-13.91		8.69
214.046725	V	15.27	43.50	-28.23		12.16
842.102175	V	22.71	43.50	-20.79		26.20
214.082	H	** 10.24	43.50	-33.26		12.16

The frequencies for measurements were determined by the suspect list generated from the shielded room prescan.

**These suspect signal levels were measured to be at or below the background noise and ambient.

Field Strength Measurements of Fundamental : [15.231(b)]

MEASUREMENT PROCEDURE:

1. The EUT was trained to one of the three test frequencies.
2. The EUT was trained to one of the three test duty cycles.
3. The EUT was setup to one of the three orthogonal positions.
4. Steps 1-3 were repeated to cover all positions, duty cycles, and frequencies.

DUT Tuned to transmit at 288MHz

Freq. MHz	DUT position	Ant. Pol.	Corrected Data Peak Detector dBuV/m	Duty Cycle %	Duty Cycle Factor dB	Calculated Average Level dBuV/m	FCC Limit dBuV/m	Delta Limit dB	Cable +Ant. Factor dB+dB/m
287.83	side	H	80.8	30%	-10.46	70.4	73.8	**-3.4**	15.2
287.95	"	"	78.1	50%	-6.02	72.1	73.8	**-1.7**	15.2
287.88	"	"	73.7	80%	-1.94	71.8	73.8	**-2.0**	15.2

DUT Tuned to transmit at 310MHz

Freq. MHz	DUT position	Ant. Pol.	Corrected Data Peak Detector dBuV/m	Duty Cycle %	Duty Cycle Factor dB	Calculated Average Level dBuV/m	FCC Limit dBuV/m	Delta Limit dB	Cable +Ant. Factor dB+dB/m
309.81	side	H	82.4	30%	-10.46	72.0	75.3	**-3.3**	15.1
310	"	"	79.5	50%	-6.02	73.5	75.3	**-1.8**	"
309.94	"	"	75.5	80%	-1.94	73.5	75.3	**-1.8**	"

DUT Tuned to transmit at 433MHz

Freq. MHz	DUT position	Ant. Pol.	Corrected Data Peak Detector dBuV/m	Duty Cycle %	Duty Cycle Factor dB	Calculated Average Level dBuV/m	FCC Limit dBuV/m	Delta Limit dB	Cable +Ant. Factor dB+dB/m
432.98	flat	V	87.6	30%	-10.46	77.2	80.8	**-3.6**	18.3
432.96	"	"	85.2	50%	-6.02	79.1	80.8	**-1.7**	"
432.75	"	"	80.9	80%	-1.94	78.9	80.8	**-1.9**	"

Field Strength Measurements of Harmonics: [15.231(b), 15.205]

DUT Tuned to transmit at 288MHz

MHz			dBuV/m	%	dB	dBuV/m	dBuV/m	dB	dB+dB/m
575.66	flat	V	58.9	30%	-10.46	48.5	53.8	**-5.3**	22.4
575.89	"	"	49.7	50%	-6.02	43.7	53.8	**-10.1**	"
575.81	flat	H	45.4	80%	-1.94	43.5	53.8	**-10.3**	"
863.4	end	V	50.0	30%	-10.46	39.5	53.8	**-14.3**	26.4
863.49	"	"	44.4	50%	-6.02	38.4	53.8	**-15.4**	"
863.52	"	"	43.9	80%	-1.94	41.9	53.8	**-11.9**	"
1151	side	V	49.5	30%	-10.46	39.0	54.0	**-15.0**	27.9
1150.6	end	V	38.7	50%	-6.02	32.7	54.0	**-21.3**	"
1151.3	flat	V	38.6	80%	-1.94	36.7	54.0	**-17.3**	"
1438.8	flat	H	53.3	30%	-10.46	42.8	54.0	**-11.2**	29.4
1439.3	flat	H	50.8	50%	-6.02	44.8	54.0	**-9.2**	"
1439.9	side	V	48.9	80%	-1.94	46.9	54.0	**-7.1**	"
1726.5	side	V	46.4	30%	-10.46	35.9	54.0	**-18.1**	30.3
1727.3	"	"	44.1	50%	-6.02	38.0	54.0	**-16.0**	"
1727.8	"	V	42.5	80%	-1.94	40.6	54.0	**-13.4**	"
2014.4	flat	H	47.9	30%	-10.46	37.4	54.0	**-16.6**	29.9
2015.2	"	"	44.0	50%	-6.02	38.0	54.0	**-16.0**	"
2016	"	"	42.0	80%	-1.94	40.0	54.0	**-14.0**	"
2303	side	V	43. noise floor	30%	-10.46	<32.5	54.0	**>-21.5**	30.9
	-	"	43. noise floor	50%	-6.02	<37.0	54.0	**>-17.0**	
"	-	"	43. noise floor	80%	-1.94	<41.1	54.0	**>-12.9**	"
2592	-	-	44. noise floor	30%	-10.46	<33.5	54.0	**>-20.5**	31.5
"	-	"	44. noise floor	50%	-6.02	<38.0	54.0	**>-16.0**	"
"	-	"	44. noise floor	80%	-1.94	<42.1	54.0	**>-11.9**	"
2880.7	flat	-	44. noise floor	30%	-10.46	<33.5	54.0	**>-20.5**	31.7
"	-	"	44. noise floor	50%	-6.02	<38.0	54.0	**>-16.0**	"
"	-	"	44. noise floor	80%	-1.94	<42.1	54.0	**>-11.9**	"

DUT Tuned to transmit at 310MHz

618.81	end	V	52.3	30%	-10.46	41.9	55.3	**-13.4**	22.1
"	"	"	49.6	50%	-6.02	43.6	55.3	**-11.7**	"
618.86	flat	H	43.8	80%	-1.94	41.8	55.3	**-13.5**	"
928.22	end	H	39.9	30%	-10.46	29.4	55.3	**-25.9**	27.2
927.82	"	"	36.8	50%	-6.02	30.8	56.3	**-25.5**	"
928.38	"	"	32.6	80%	-1.94	30.7	57.3	**-26.6**	"
1239.2	flat	H	42.9	30%	-10.46	32.5	54.0	**-21.6**	28.1
1239.6	side	V	41.3	50%	-6.02	35.3	54.0	**-18.7**	"
1239.3	flat	H	40.8	80%	-1.94	38.9	54.0	**-15.1**	"
1549	"	"	50.4	30%	-10.46	39.9	54.0	**-14.1**	29.7
1549.5	"	"	47.9	50%	-6.02	41.9	54.0	**-12.1**	"
1549.2	"	"	46.4	80%	-1.94	44.4	54.0	**-9.6**	"
1858.9	end	H	41.3	30%	-10.46	30.8	55.3	**-24.5**	29.5
1859.4	"	"	40.6	50%	-6.02	34.6	55.3	**-20.7**	"
1859.6	"	"	40.6	80%	-1.94	38.7	55.3	**-16.6**	"
2168.5	flat	H	42.7	30%	-10.46	32.3	55.3	**-23.0**	30.5
2169.2	"	"	42.6	50%	-6.02	36.5	55.3	**-18.8**	"
"	-	-	42.6	80%	-1.94	40.6	55.3	**-14.7**	"
2478.8	-	-	49. noise floor	30%	-10.46	<38.5	55.3	**>-16.8**	31.4
	-	"	49. noise floor	50%	-6.02	<37.0	55.3	**>-12.3**	
"	-	"	49. noise floor	80%	-1.94	<47.1	55.3	**>-8.2**	"
2787.5	-	-	44. noise floor	30%	-10.46	<33.5	54.0	**>-20.5**	31.6
"	-	"	44. noise floor	50%	-6.02	<38.0	54.0	**>-16.0**	"
"	-	"	44. noise floor	80%	-1.94	<42.1	54.0	**>-11.9**	"
3095.8	-	-	48. noise floor	30%	-10.46	<37.5	54.0	**>-16.5**	32.0
"	-	"	48. noise floor	50%	-6.02	<42.0	54.0	**>-12.0**	"
"	-	"	48. noise floor	80%	-1.94	<46.1	54.0	**>-7.9**	"

DUT Tuned to transmit at 433MHz

865.91	flat	H	60.5	30%	-10.46	50.0	60.3	**-10.3**	26.5
865.56	"	H	58.4	50%	-6.02	52.4	60.3	**-7.9**	"
865.85	end	H	51.9	80%	-1.94	50.0	60.3	**-10.3**	"
1298	flat	H	54.4	30%	-10.46	44.0	54.0	**-10.0**	28.2
1297.8	"	"	51.1	50%	-6.02	45.1	54.0	**-8.9**	"
1298.4	"	"	48.5	80%	-1.94	46.5	54.0	**-7.5**	"
1730.9	side	V	50.8	30%	-10.46	40.3	54.0	**-13.7**	30.1
1730.4	"	"	49.3	50%	-6.02	43.3	54.0	**-10.7**	"
1731.2	"	"	47.5	80%	-1.94	45.5	54.0	**-8.5**	"
2163.5	end	V	46.5	30%	-10.46	36.0	60.3	**-24.3**	30.4
2163.6	flat	H	44.5	50%	-6.02	38.4	60.3	**-21.9**	"
2163.9	end	V	45.2	80%	-1.94	43.3	60.3	**-17.0**	"
2597.4	side	V	43.6	30%	-10.46	33.1	60.3	**-27.2**	33.0
"	"	"	43.1	50%	-6.02	37.1	60.3	**-23.2**	"
"	"	"	43.0	80%	-1.94	41.1	60.3	**-19.2**	"
3030.7	-	-	49. noise floor	30%	-10.46	<38.5	60.3	**>-21.8**	33.3
"	-	"	49. noise floor	50%	-6.02	<43.0	60.3	**>-17.3**	"
"	-	"	49. noise floor	80%	-1.94	<37.1	60.3	**>-13.2**	"
3461.5	-	-	48. noise floor	30%	-10.46	<37.5	60.3	**>-22.8**	34.4
	-		48. noise floor	50%	-6.02	<42.0	60.3	**>-18.3**	
"	-	"	48. noise floor	80%	-1.94	<46.1	60.3	**>-14.2**	"
3894.7	-	-	51. noise floor	30%	-10.46	<40.5	54.0	**>-13.5**	34.8
"	-	"	51. noise floor	50%	-6.02	<45.0	54.0	**>-9.0**	"
"	-	"	51. noise floor	80%	-1.94	<49.1	54.0	**>-4.9**	"
4330.5	-	-	52. noise floor	30%	-10.46	<41.5	54.0	**>-12.5**	35.0
"	-	"	52. noise floor	50%	-6.02	<46.0	54.0	**>-8.0**	"
"	-	"	52. noise floor	80%	-1.94	<50.1	54.0	**>-3.9**	"

Calculation of Field Strength of Tuning Pulses: [15.231(b)], 15.31(c)]

The tuning pulses are generated each time the 070NHL4 is activated.

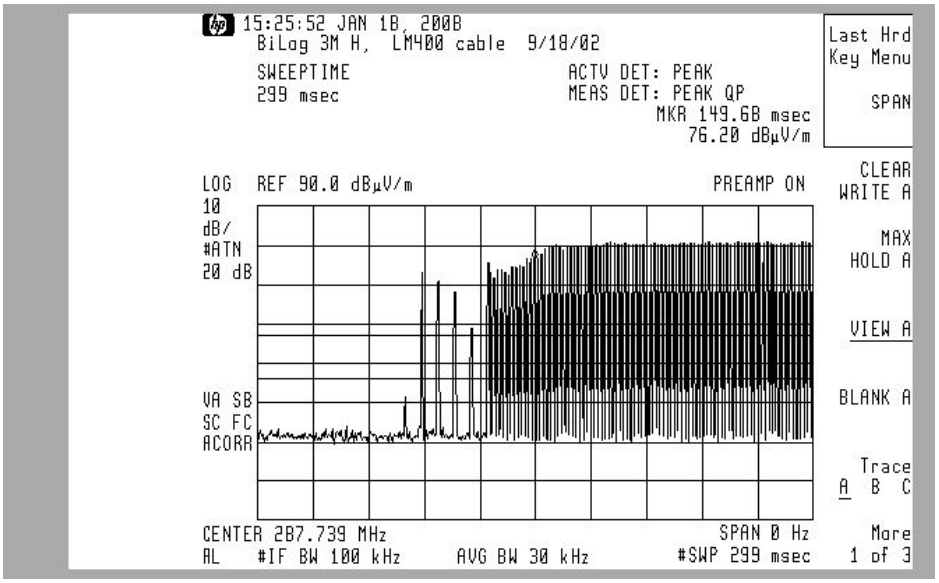
One of the innovations of HL4 since HL3 is the elimination of the course tuning pulses. The level of the fine tuning pulses is reduced below the normal transmission level. As a result the tuning pulses do not represent even a 10% duty cycle. This results in the maximum correction factor of 20dB.

The tuning pulse sequence is: During the first 100mSec of activation are three to nine pulses of a 'fine' tune. At approximately 100mSec after activation the encoded transmission begins.

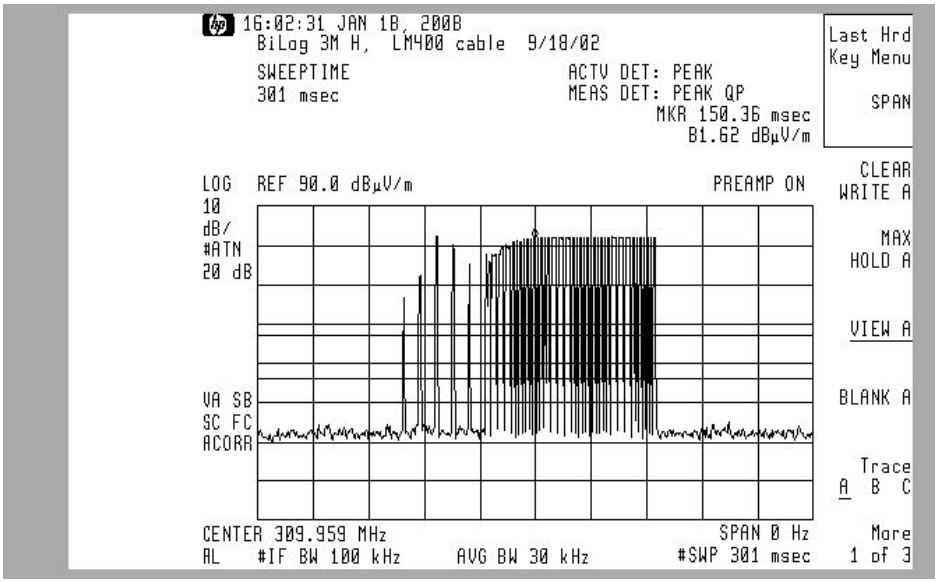
The signal levels of the tuning pulses were maximized by maximizing the signal levels of the pulse modulated transmission. The antenna height and turntable azimuth for maximum emission levels were adjusted while measuring the field strength of the pulse modulated transmissions.

The typical tuning pulse sequence for 288, 310 and 433 are presented in the following figures below.

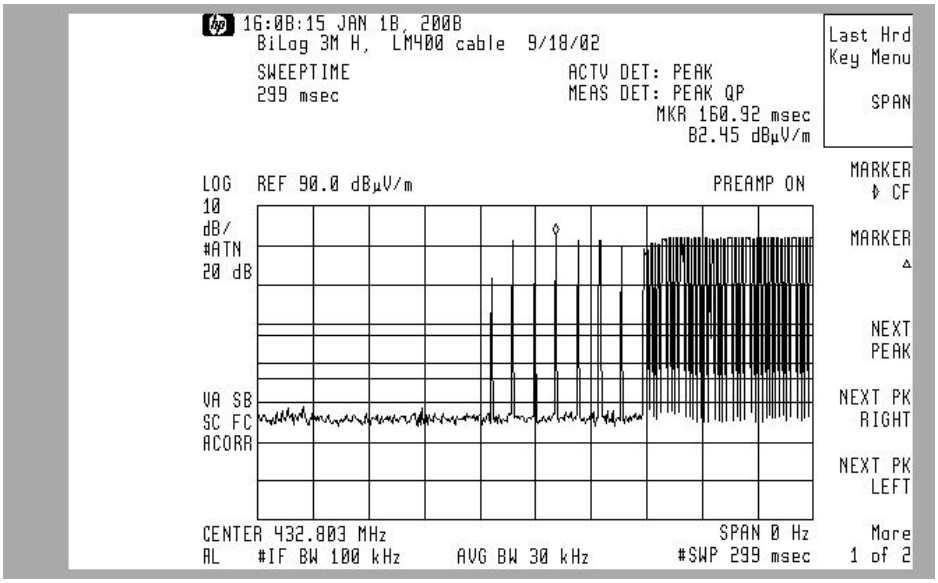
DUT Tuned to transmit at 288Mhz:



DUT Tuned to transmit at 310Mhz:



DUT Tuned to transmit at 433Mhz:



Other information contained in separate files:
Summary of tuning data table.
IC standards applicable and Calculation for IC RSS 210.
Other Attachment and description:
user manual refer .. Pdf
#schematics... (file name .pdf) and # theory of operation (file name .pdf)
#emission designator details
#label diagram (file name .pdf)

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2007-07-01 through 2008-06-30
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2005-05-13)

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

May 17, 2005

Registration Number: 90413

AHD EMC Laboratory
92723 M-152
Dowagiac, MI 49047

Attention: Gordon Helm

Re: Measurement facility located at Sister Lakes
3 & 10 meter site
Date of Renewal: May 17, 2005

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish
Information Technician

NARTE Seal