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

Test Report for FCC ID: CB2825NHL3

FCC Part 2.1031, Part 15 Subpart C(15.231)

Report #0200510F
Issued 06/18/02

TRANSMITTER MODEL CB2825NHL3 OF HOMELINK® III SERIES

Prepared for:

Mr. Craig Harder
Johnson Controls Interiors, LLC
One Prince Center
Holland, MI 49423

Test Date(s): March 5, April 22,23, May 2,7, 2002

data recorded by witnessed by

Gordon Helm, PE
Ted Chaffee, NCE

This report prepared by:

Ted Chaffee, NCE
Technical Manager/Test Engineer, AHD

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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 CFT Part 15 – Digital Devices.

AS/NZS 3548: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment.

IEC61000-4-2 and Amend.1: ElectroStatic Discharge Immunity

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

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)]

Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	22-Aug-01	12 month
RF Receiver Section	HP-85462A	3625A00342	22-Aug-01	12 month
EMCO BiconiLog Antenna	3142	1077	24-Aug-01	12 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	11-Jun-01	12 months
(3-M) Type 129FF Ultra Flex LowLoss	RG58/U	9910-12	02-Feb-02	6 months
(3-M) LMR-400 Ultra Flex	LMR400	9812-11	02-Feb-02	6 months
(10-M) Amelco 50ohm Coax	RG213/U	9903-10ab	02-Feb-02	6 months
50ohm Coax	RG223/U	9802302	11-Jun-01	12 months
Double Ridged Horn	ONO91202-2	A00329	17-Apr-01	36 months

Measurement Environment

The tests were performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 22deg.C., the relative humidity 35%.

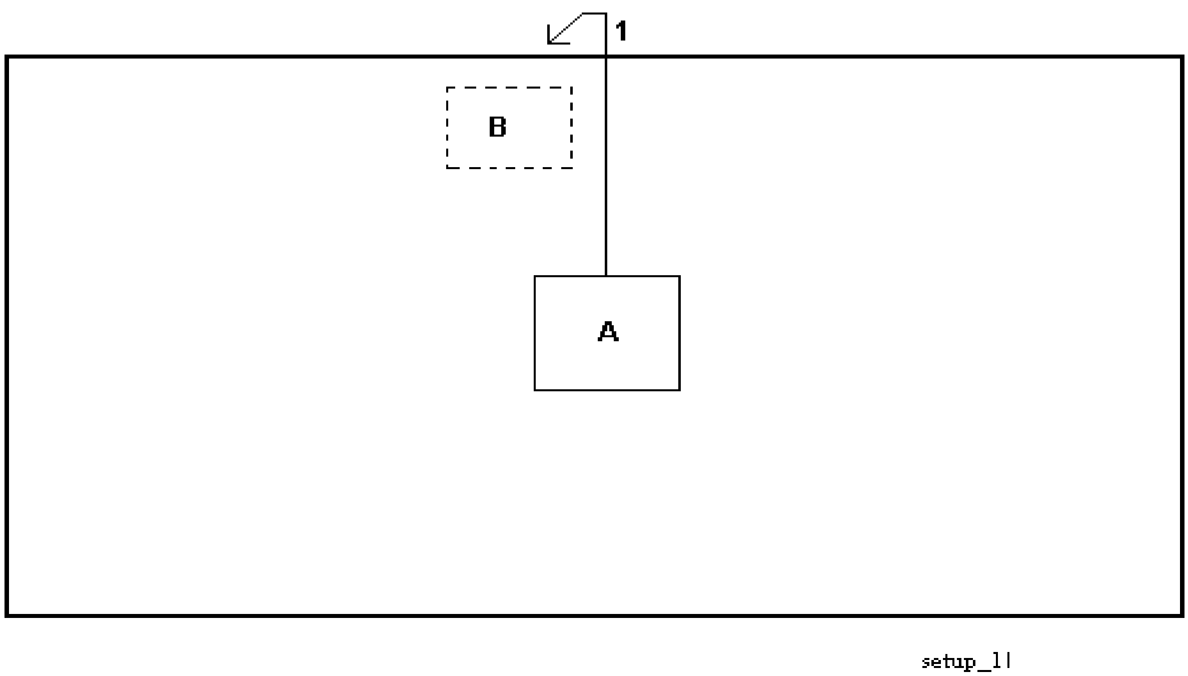
Tested Configuration /Setup: [2.1033(b8)]

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] Universal Garage Door Opener	[JCI] CB2825NHL3	preproduction	FCC ID: CB2825NHL3
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 Diagram

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



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 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).
3. The equipment under test was received on March 5, 2002 and this test series commenced on March 5, 2002.
4. The line conducted emission testing does not apply to this product. The device is powered from a 12 volt automobile source.
5. The frequencies selected for final evaluation include 288MHz, 310MHz, and 418MHz. 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.
6. Occupied Band Width of the transmitted signal, at the 20dB point, nearest the limit was measured to be 585KHz. 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 585KHz.
7. The preliminary scan for spurious emissions conducted in a shielded room indicated low level spurious signals.
8. The digital spurious emissions listed as suspects were all at or below the area ambient signals. The frequency signal, nearest the limit, occurred at 91.1MHz. The quasi-peak level was measured to be 34.3dBuV/m which is 9.2dB below the FCC Class B limit.
9. The field strength level of the fundamental was measured for 288MHz, 310MHz, and 418MHz. The evaluation showed the emission nearest the limit occurred while operating at 418MHz with 500Hz pulsed modulation at a 50% duty cycle. The EUT was positioned on the ‘end’ and the receive antenna oriented in the vertical polarization. This signal was measured to be 1.4dB below the limit of 80.3dBuV/m (10,333uV/m).
10. The evaluation of the field strength levels of the harmonics showed the emission nearest the limit occurred while operating at 310MHz with 500Hz pulsed modulation at 30% duty cycle. The EUT was positioned on the ‘side’; and the receive antenna oriented in the vertical polarization. This signal, at 620MHz, was measured to be 3.9dB below the limit of 55.3dBuV/m (582uV/m).

11. The average value of the coarse tune pulses over a 100mSec time, nearest the limit, occurred while operating at 418MHz. The average measurement was determined to be 5274uV/m which is 5.8dB below the limit of 10,333uV/m..
12. The average value of the fine tune pulses over a 100mSec time, nearest the limit, occurred while operating at 310MHz. The average measurement was determined to be 843uV/m which is 16.8dB below the limit of 5,833uV/m.

Changes made to achieve compliance

1. NONE

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

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.

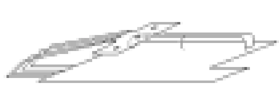
The turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions.

Preliminary tests were done at 288MHz, 310MHz, 340MHz, 365MHz, 390MHz, and 418MHz. The final measurements were made at a low band frequency (288MHz), a mid band frequency (310MHz), and a high band frequency (418MHz) 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.

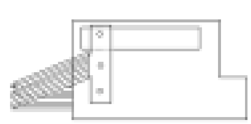
The unit was evaluated up to the tenth harmonic of the fundamental as an intentional radiator, and up to 1000MHz as a digital device.

The orthogonal positions of EUT are:

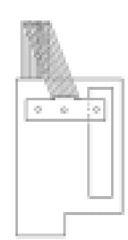
Flat



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.

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

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

418MHz $(418 - 260) / (470 - 260) = (L_0 - 3750) / (12500 - 3750)$
$(158 / 210) * (8750) = L_0 - 3750$
$L_0 = 6583.3 + 3750$
$L_0 = 10333.3$ uV/m is LIMIT at 418MHz

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

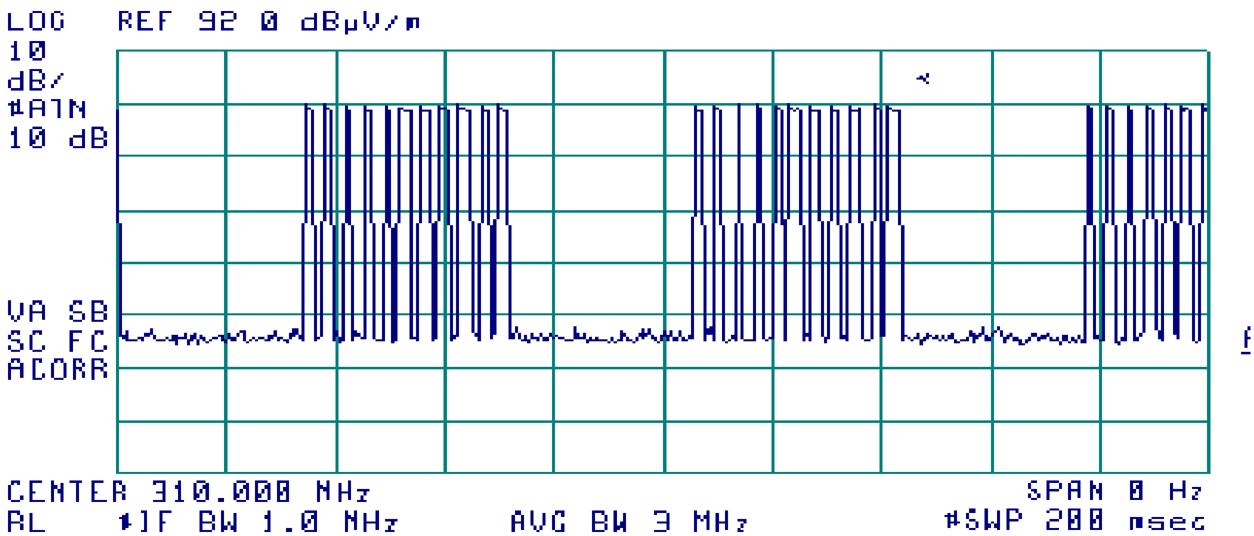
310MHz dB limit is 20 * LOG(5833.3 uV/m) = 75.3 dBuV/m

418MHz dB limit is 20 * LOG(10333.3 uV/m) = 80.3 dBuV/m

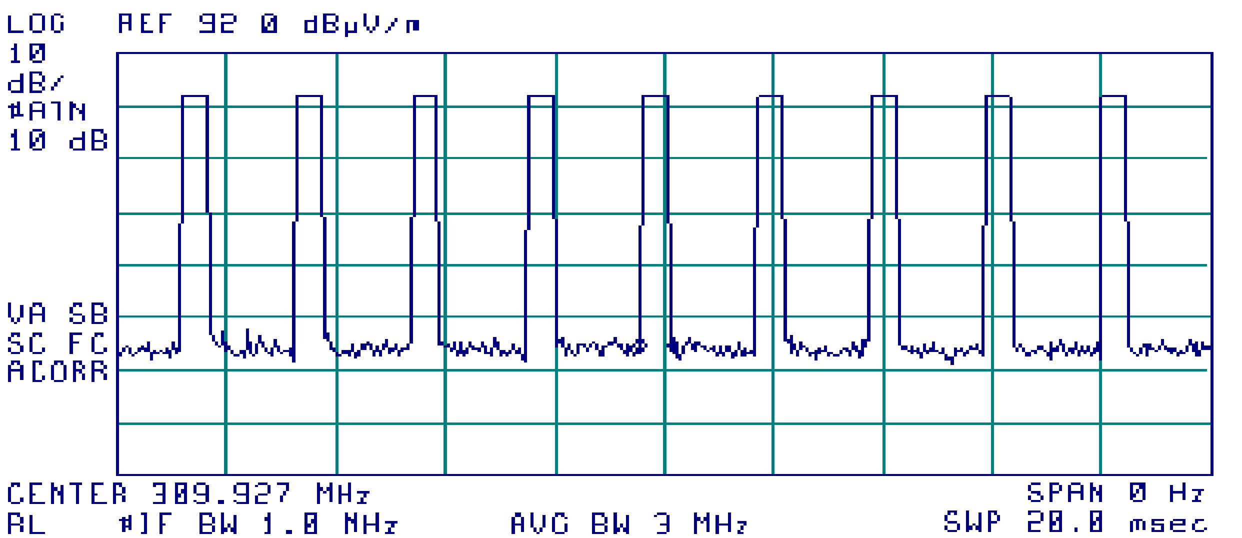
Test Data [2.1033(b6)]

Modulation Characteristics

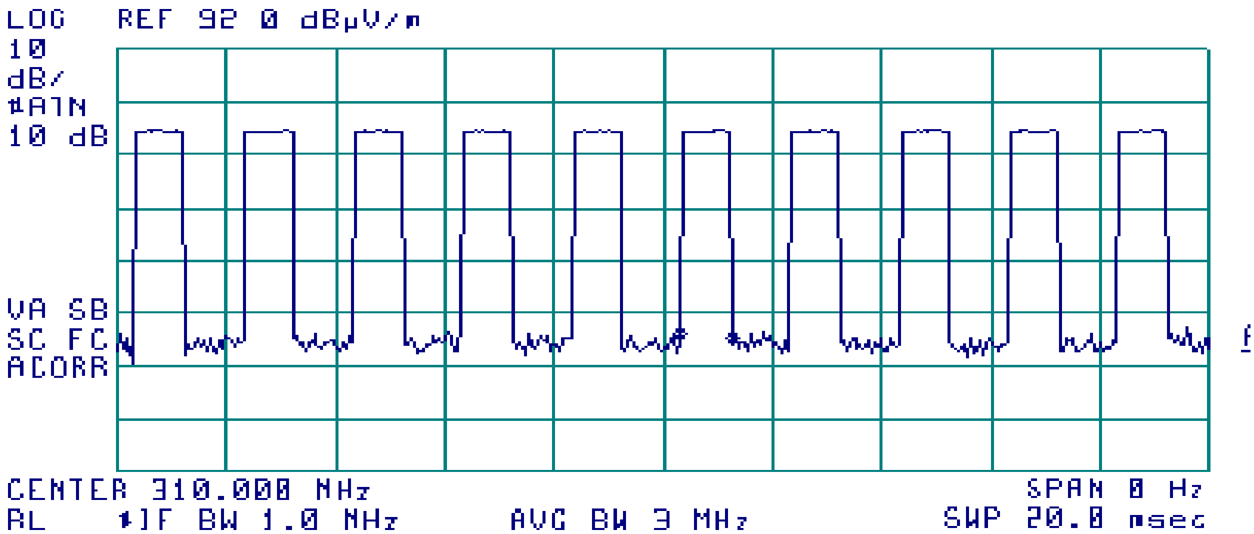
Typical encoding at 310MHz: Consisting of pulses of differing duty cycles.



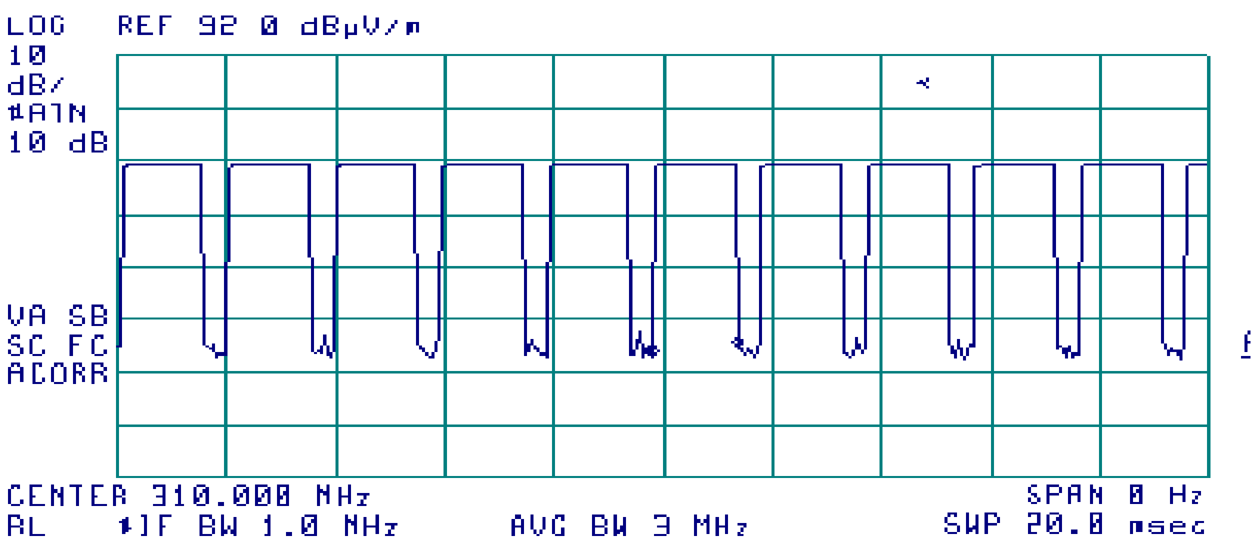
310MHz, 500Hz Modulation, 30% duty cycle



310MHz, 500Hz Modulation, 50% duty cycle



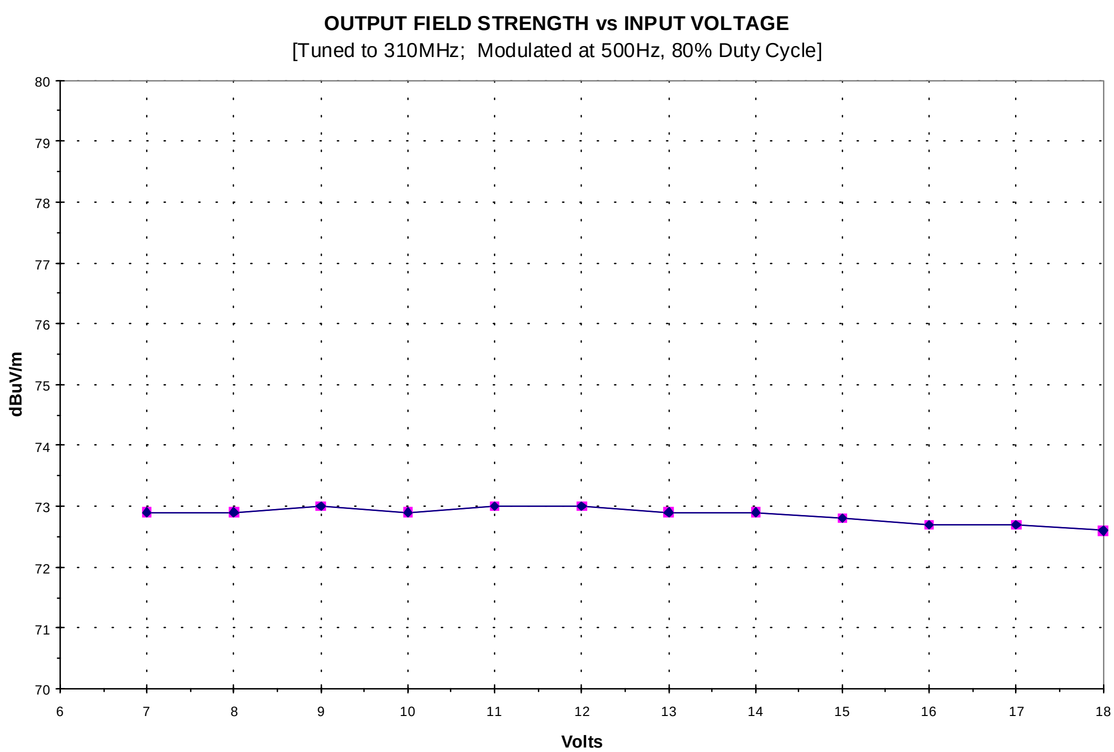
310MHz, 500Hz Modulation, 80% duty cycle



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

The relative emission level as the supply voltage varied is presented in the charts below.

TX OUTPUT vs. Voltage LEVEL DUT= CB2825NHL3, 310MHz, 80%duty cycle	
Volt In	TX OutPut Pk dBuV/m
6	NoOperation
7	72.9
8	72.9
9	73
10	72.9
11	73
12	73
13	72.9
14	72.9
15	72.8
16	72.7
17	72.7
18	72.6



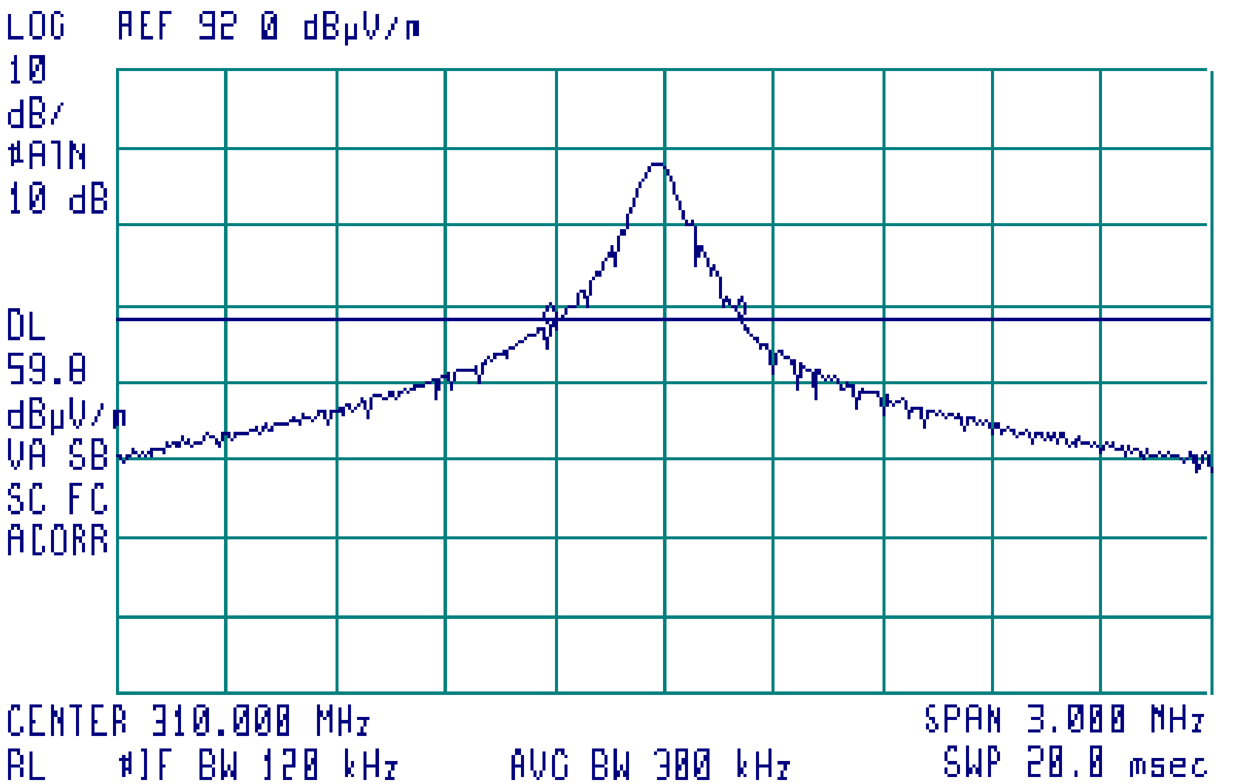
Occupied Bandwidth [15.231(c)]

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
288	30%	585 KHz	720 KHz
“	50%	518 KHz	720 KHz
“	80%	458 KHz	720 KHz
310	30%	555 KHz	775 KHz
“	50%	525 KHz	775 KHz
“	80%	473 KHz	775 KHz
418	30%	578 KHz	1045 KHz
“	50%	555 KHz	1045 KHz
“	80%	503 KHz	1045 KHz

<u>This chart shows a typical measured bandwidth signal.</u>



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 420MHz except that the Homelink® III firmware prevents the possibility of tuning to the restricted regions of 322-335.4MHz, 399.9-410Mhz, and the region 304-307MHz.

An exercise which attempted to train the units into these restricted bands demonstrated how well the firmware functioned. The unit could not be trained any closer than 1MHz to the restricted bands of 15.205 and no closer than 500KHz outside the band 304-307MHz.

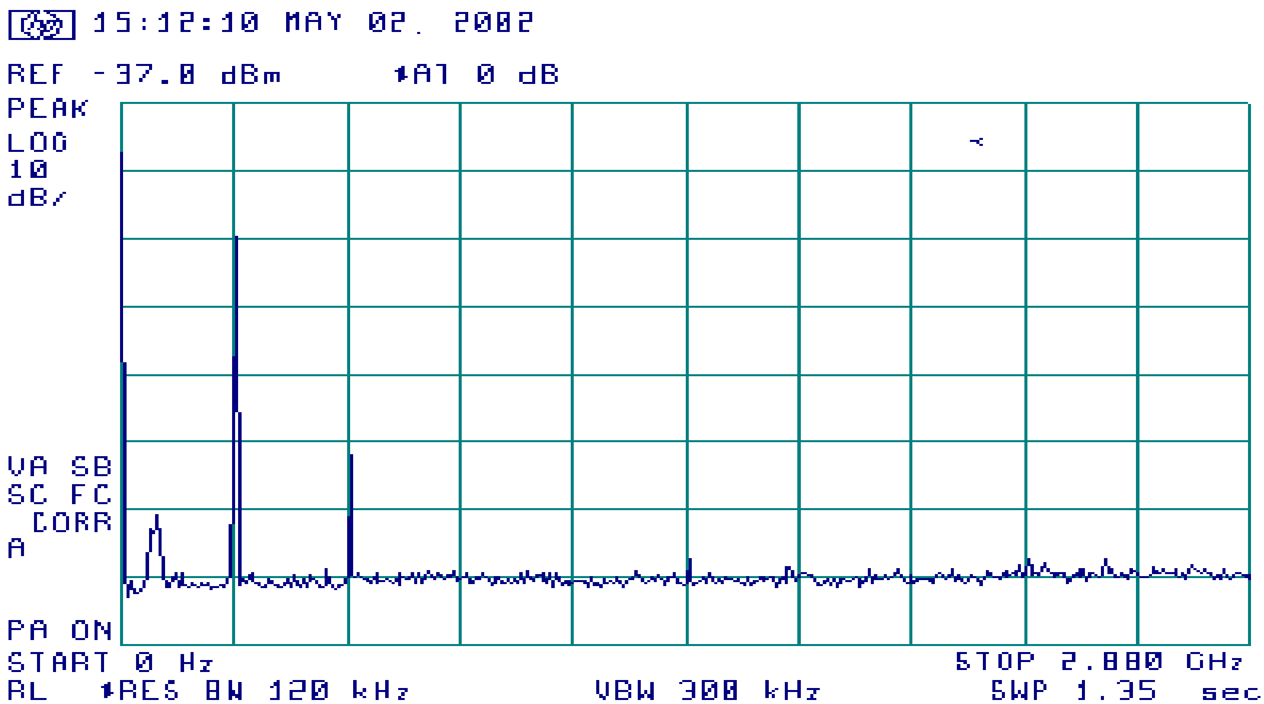
The spurious emissions observed in the restricted bands did not exceed the allowed limits for the restricted bands.

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

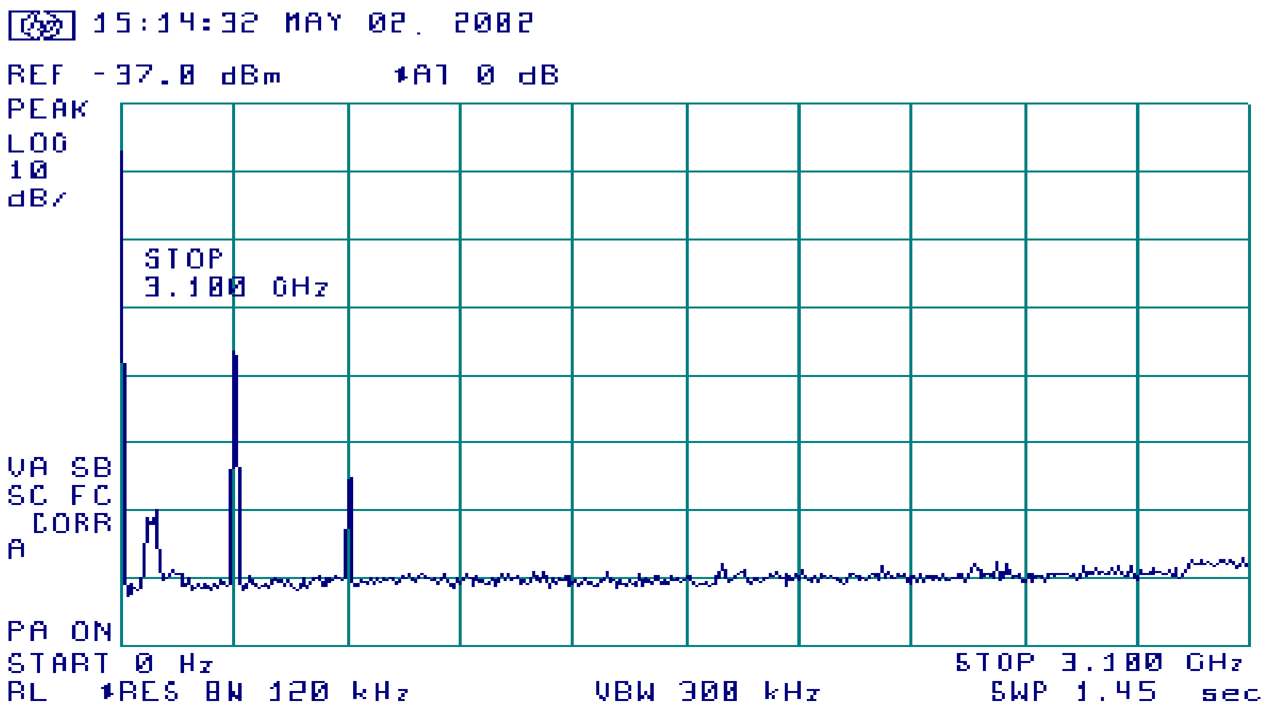
A scan of the CB2825NHL3 was made in a shielded room to study the emission profile of the EUT. These scans indicate there are low level spurious emissions from the unit other than the fundamental and its associated harmonics. These suspect signals were measured at the 3-meter open area test site.

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.

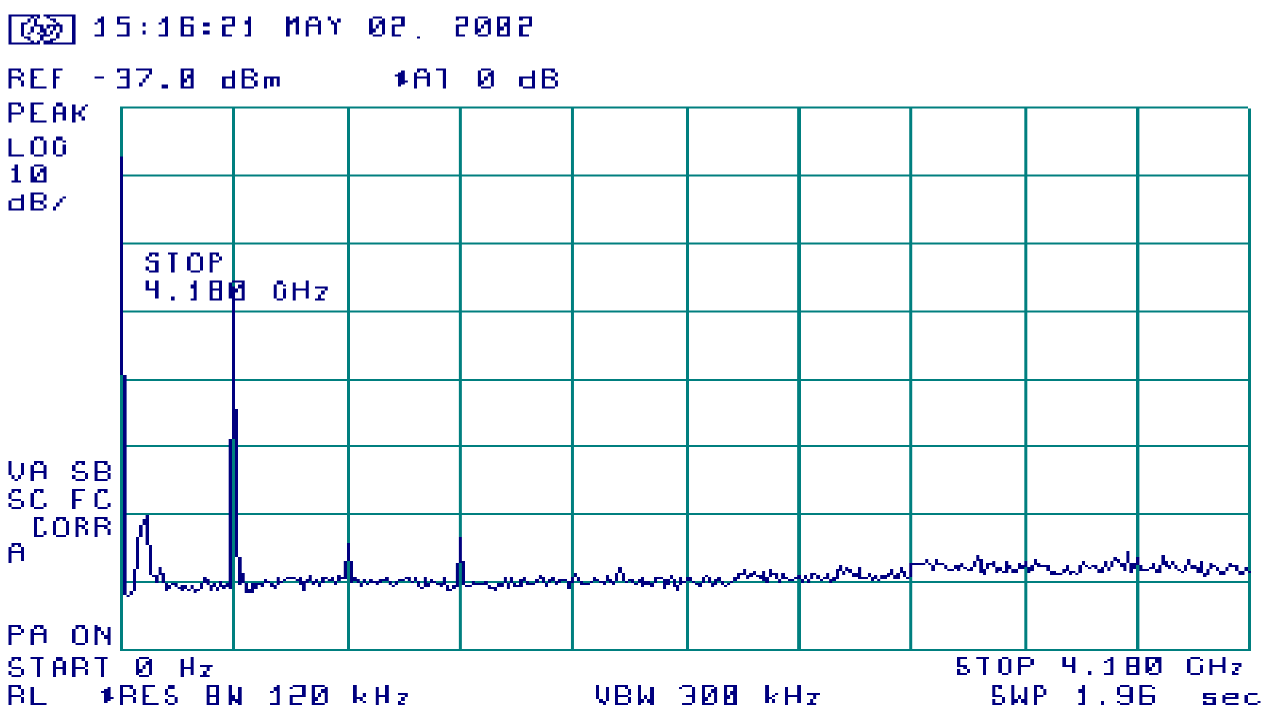
EUT trained to 288MHz operation



EUT trained to 310MHz operation

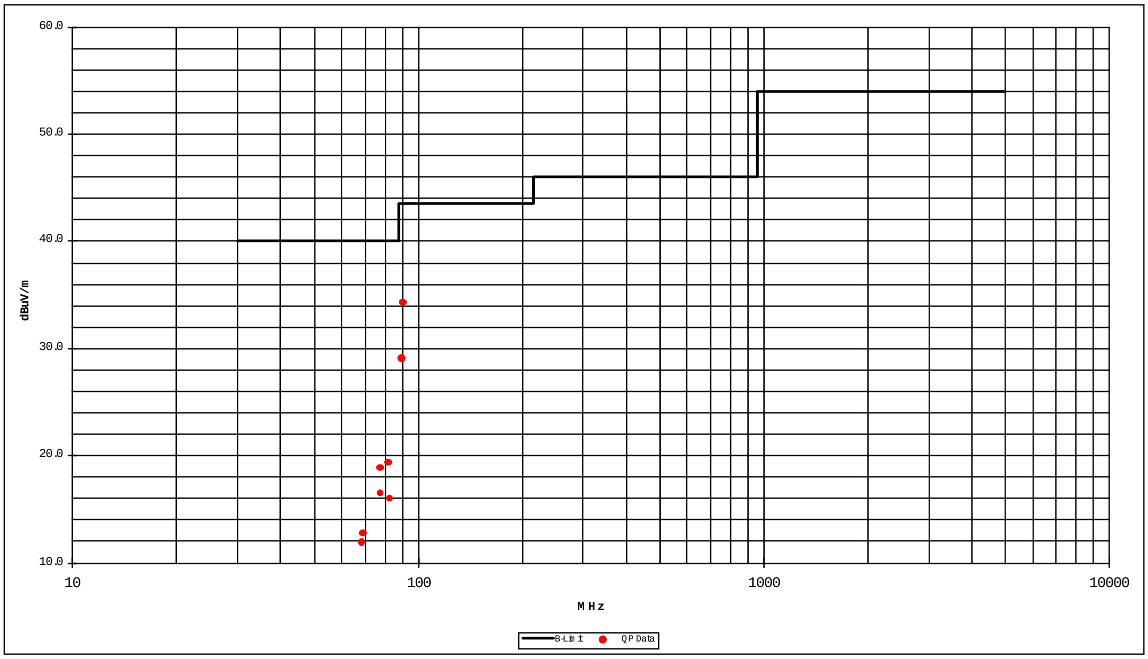


EUT trained to 418MHz operation.



Radiated Field Strength Measurements

Graph of Quasi-Peak Measurements



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
69.57	H	**12.77	40.00	-27.23		7.98
78.11	H	**18.85	40.00	-21.15		7.67
82.38	H	**19.35	40.00	-20.65		7.68
91.08	H	**34.28	43.50	-9.22		8.32

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
288	side	H	80.7	30%	-10.46	70.2	73.8	**-3.6**	14.7
"	"	"	77.9	50%	-6.02	71.9	73.8	**-1.9**	"
"	"	"	72.5	80%	-1.94	70.6	73.8	**-3.2**	"

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
310	side	H	83.4	30%	-10.46	72.9	75.3	**-2.4**	15.1
"	"	"	79.8	50%	-6.02	73.8	75.3	**-1.5**	"
"	"	"	73.8	80%	-1.94	71.9	75.3	**-3.4**	"

DUT Tuned to transmit at 418MHz

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
418	end	V	88.4	30%	-10.46	77.9	80.3	**-2.4**	18.3
"	"	"	84.9	50%	-6.02	78.9	80.3	**-1.4**	"
"	"	"	79.3	80%	-1.94	77.4	80.3	**-2.9**	"

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

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
576	side	V	58.1	30%	-10.46	47.6	53.8	**-6.2**	21.4
"	"	"	53.3	50%	-6.02	47.3	53.8	**-6.5**	"
"	flat	H	44.3	80%	-1.94	42.4	53.8	**-11.4**	"
864	-	V	44 noise floor	30%	-10.46	<33.5	53.8	**>-20.3**	25.3
"	-	"	44 noise floor	50%	-6.02	<38.0	53.8	**>-15.8**	"
"	-	"	44 noise floor	80%	-1.94	<42.1	53.8	**>-11.7**	"
1152	end	V	39.2	30%	-10.46	28.7	54.0	**-25.3**	28.7
"	"	"	39.0	50%	-6.02	33.0	54.0	**-21.0**	"
"	"	"	37.1	80%	-1.94	35.2	54.0	**-18.8**	"
1440	end	V	42.3	30%	-10.46	31.8	54.0	**-22.2**	29.4
"	"	"	40.2	50%	-6.02	34.2	54.0	**-19.8**	"
"	"	"	39.7	80%	-1.94	37.8	54.0	**-16.2**	"
1728	side	V	38.1	30%	-10.46	27.6	54.0	**-26.4**	30.3
"	"	"	36.6	50%	-6.02	30.6	54.0	**-23.4**	"
"	"	"	34.2	80%	-1.94	32.3	54.0	**-21.7**	"
2016	flat	V	33.0	30%	-10.46	22.5	54.0	**-31.5**	31.2
"	"	"	31.9	50%	-6.02	25.9	54.0	**-28.1**	"
"	-	"	31.6	80%	-1.94	29.7	54.0	**-24.3**	"
2304	-	V	33 noise floor	30%	-10.46	<22.5	54.0	**>-31.5**	32.3
	-	"	33 noise floor	50%	-6.02	<27.0	54.0	**>-27.0**	
"	-	"	33 noise floor	80%	-1.94	<31.1	54.0	**>-22.9**	"
2592	-	V	34 noise floor	30%	-10.46	<23.5	54.0	**>-30.5**	33.1
"	-	"	34 noise floor	50%	-6.02	<28.0	54.0	**>-26.0**	"
"	-	"	34 noise floor	80%	-1.94	<32.1	54.0	**>-21.9**	"
2880	-	V	34 noise floor	30%	-10.46	<23.5	54.0	**>-30.5**	33.3
"	-	"	34 noise floor	50%	-6.02	<28.0	54.0	**>-26.0**	"
"	-	"	34 noise floor	80%	-1.94	<32.1	54.0	**>-21.9**	"

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
620	side	V	61.9	30%	-10.46	51.4	55.3	**-3.9**	22.1
"	"	"	56.7	50%	-6.02	50.7	55.3	**-4.6**	"
"	end	"	46.8	80%	-1.94	44.9	55.3	**-10.4**	"
930	side	H	52.3	30%	-10.46	41.8	55.3	**-13.5**	25.8
"	"	"	52.1	50%	-6.02	46.1	55.3	**-9.2**	"
"	"	"	44.8	80%	-1.94	42.9	55.3	**-12.4**	"
1240	end	H	38.8	30%	-10.46	28.3	54.0	**-25.7**	29.0
"	"	"	38.3	50%	-6.02	32.3	54.0	**-21.7**	"
"	"	"	36.7	80%	-1.94	34.8	54.0	**-19.2**	"
1550	flat	H	41.3	30%	-10.46	30.8	54.0	**-23.2**	29.7
"	"	"	39.2	50%	-6.02	33.2	54.0	**-20.8**	"
"	"	V	35.3	80%	-1.94	33.4	54.0	**-20.6**	"
1860	side	V	37.7	30%	-10.46	27.2	55.3	**-28.1**	30.7
"	"	"	33.7	50%	-6.02	27.7	55.3	**-27.6**	"
"	end	H	31.4	80%	-1.94	29.5	55.3	**-25.8**	"
2170	flat	H	34.5	30%	-10.46	24.0	55.3	**-31.3**	31.8
"	"	"	33.7	50%	-6.02	27.7	55.3	**-27.6**	"
"	"	V	31.7	80%	-1.94	29.8	55.3	**-25.5**	"
2480	-	V	34 noise floor	30%	-10.46	<23.5	55.3	**>-31.8**	32.9
	-		34 noise floor	50%	-6.02	<28.0	55.3	**>-27.3**	
"	-	"	34 noise floor	80%	-1.94	<32.1	55.3	**>-23.2**	"
2790	-	V	33 noise floor	30%	-10.46	<22.5	54.0	**>-31.5**	33.2
"	-	"	33 noise floor	50%	-6.02	<27.0	54.0	**>-27.0**	"
"	-	"	33 noise floor	80%	-1.94	<31.1	54.0	**>-22.9**	"
3100	-	V	33 noise floor	30%	-10.46	<22.5	54.0	**>-31.5**	33.7
"	-	"	33 noise floor	50%	-6.02	<27.0	54.0	**>-27.0**	"
"	-	"	33 noise floor	80%	-1.94	<31.1	54.0	**>-22.9**	"

DUT Tuned to transmit at 418MHz

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
836	end	H	61.5	30%	-10.46	51.0	60.3	**-9.3**	25.0
"	"	"	55.3	50%	-6.02	49.3	60.3	**-11.0**	"
"	"	"	49.2	80%	-1.94	47.3	60.3	**-13.0**	"
1254	flat	H	38.1	30%	-10.46	27.6	54.0	**-26.4**	29.0
"	end	"	36.8	50%	-6.02	30.8	54.0	**-23.2**	"
"	"	"	36.8	80%	-1.94	34.9	54.0	**-19.1**	"
1672	side	V	45.1	30%	-10.46	34.6	54.0	**-19.4**	30.1
"	flat	H	40.1	50%	-6.02	34.1	54.0	**-19.9**	"
"	"	"	38.1	80%	-1.94	36.2	54.0	**-17.8**	"
2090	end	H	37.7	30%	-10.46	27.2	60.3	**-33.1**	31.5
"	"	"	36.3	50%	-6.02	30.3	60.3	**-30.0**	"
"	"	"	34.9	80%	-1.94	33.0	60.3	**-27.3**	"
2508	end	V	33 noise floor	30%	-10.46	<22.5	60.3	**>-37.8**	33.0
"	"	"	33 noise floor	50%	-6.02	<27.0	60.3	**>-33.3**	"
"	"	"	33 noise floor	80%	-1.94	<31.1	60.3	**>-29.2**	"
2926	-	V	33 noise floor	30%	-10.46	<22.5	60.3	**>-37.8**	33.3
"	-	"	33 noise floor	50%	-6.02	<27.0	60.3	**>-33.3**	"
"	-	"	33 noise floor	80%	-1.94	<31.1	60.3	**>-29.2**	"
3344	-	V	33 noise floor	30%	-10.46	<24.5	60.3	**>-35.2**	34.4
	-		33 noise floor	50%	-6.02	<27.0	60.3	**>-33.3**	
"	-	"	33 noise floor	80%	-1.94	<31.1	60.3	**>-29.2**	"
3762	-	V	34 noise floor	30%	-10.46	<23.5	54.0	**>-30.5**	34.8
"	-	"	34 noise floor	50%	-6.02	<28.0	54.0	**>-26.0**	"
"	-	"	34 noise floor	80%	-1.94	<29.1	54.0	**>-24.9**	"
4180	-	V	34 noise floor	30%	-10.46	<23.5	54.0	**>-30.5**	35.0
"	-	"	34 noise floor	50%	-6.02	<28.0	54.0	**>-26.0**	"
"	-	"	34 noise floor	80%	-1.94	<32.1	54.0	**>-21.9**	"

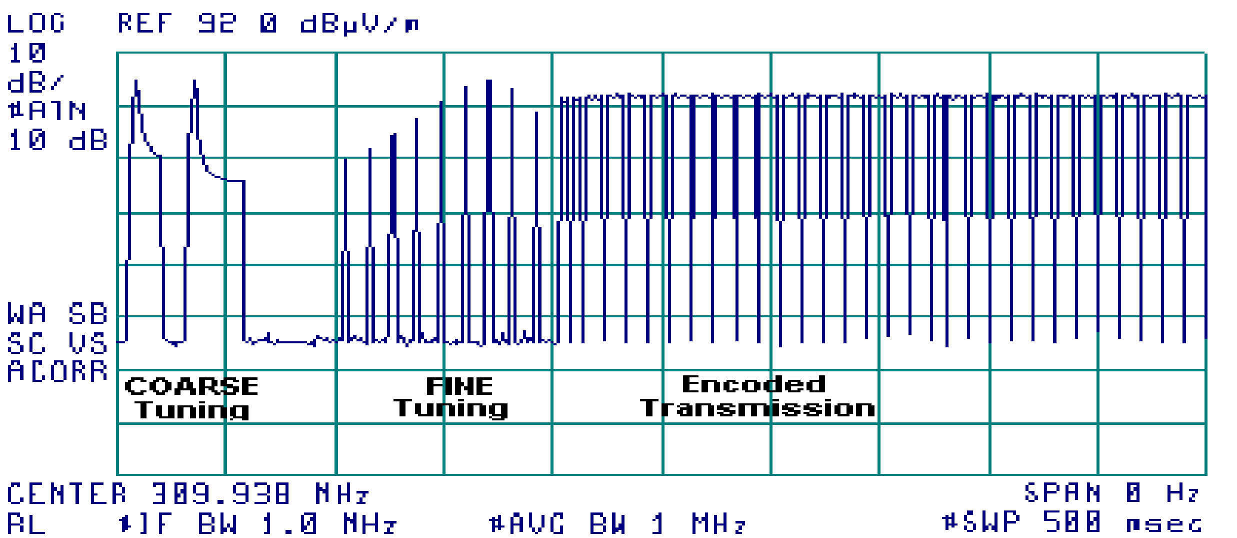
Calculation of Field Strength of Tuning Pulses: [15.231(b)], 15.31(c)]

The tuning pulses are generated each time the CB2825NHL3 is activated.

The tuning pulse sequence is: During the first 100mSec of activation two pulses of a 'coarse' tune. During the second 100mSec of activation are nine pulses of a 'fine' tune. At approximately 200mSec 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.

A typical tuning pulse sequence is presented in this figure below.



To determine level of the tuning pulses for comparison to the limits, the following procedure was used.

MEASUREMENT PROCEDURE:

1. The EUT was trained to each of the three test frequencies at 30% duty cycle of the 500Hz modulating pulse.
2. The HP8456A EMI Receiver was adjusted to a fundamental frequency and set at 0Hz span, with 1MHz IF Bandwidth.
3. The trigger level was adjusted to capture the pulses of interest.
4. The EUT was activated and a single trace recorded on the Receiver in order to capture the tuning pulses.
5. The captured trace was digitally stored. The stored data points (400 data points for a full screen trace) were then used in calculations to determine the levels of the pulses.

CALCULATION OF THE FIELD STRENGTH OF THE TUNING PULSES.[15.35(c)]

Pursuant to 47 CFR 15.35(c), the field strength is determined by averaging over ONE complete pulse train up to 100mSec, including blanking intervals.

1. First was determined the number of data points captured which represented 100mSec span of time. There are 400 data points stored for one complete trace. The scan rate of the HP8546A receiver was set to capture the tuning pulses.

   Therefore: Number of data points per 100mSec
   = 100mSec * (400pts/scan) / (No. of mSec/scan).

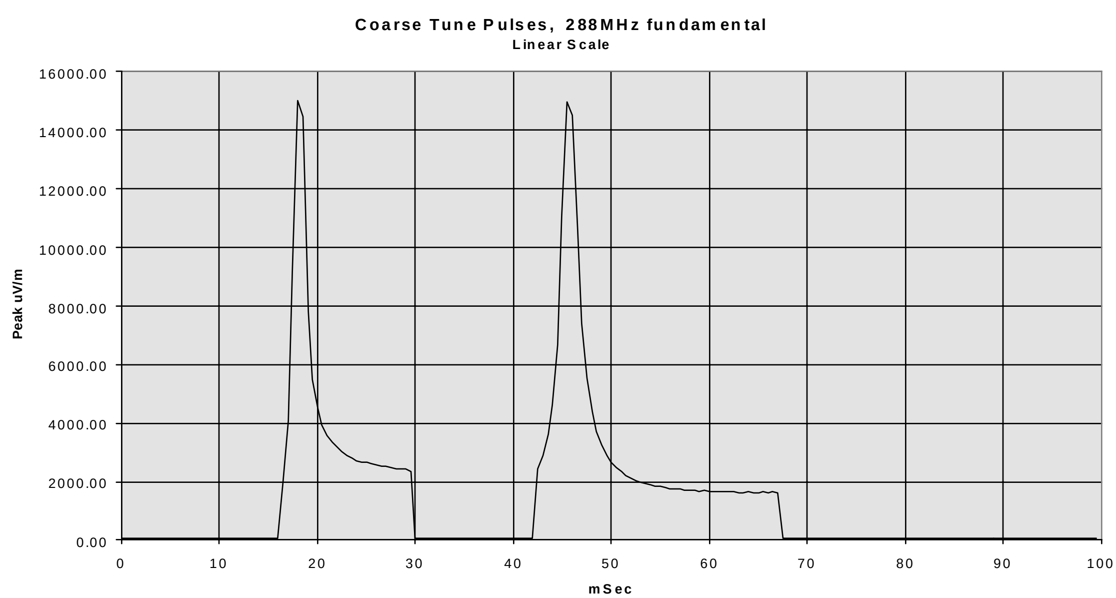
   Example: If the scan rate is set at 200mSec, then the number of data points per 100mSec is 100mSec * (400pts / 200mSec) = 200 pts.

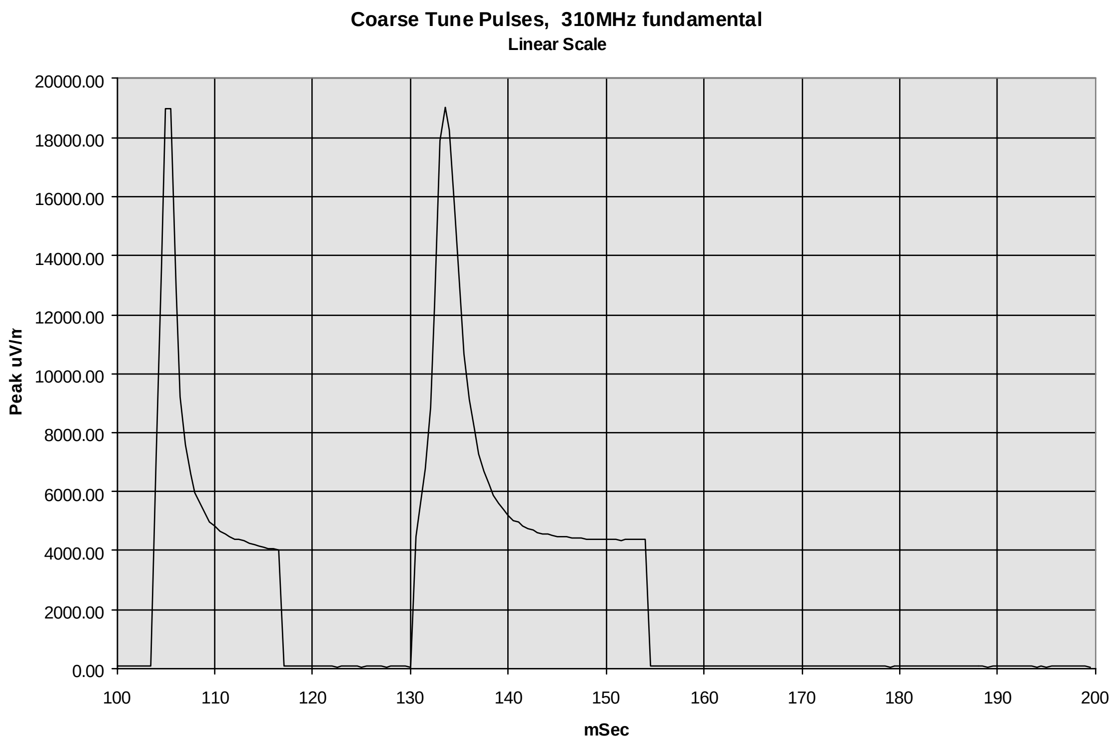
2. The AVERAGE field strength level (uV/m) within the 100mSec is then determined by dividing SUM of the levels (uV/m) of all data points by the number of data points.

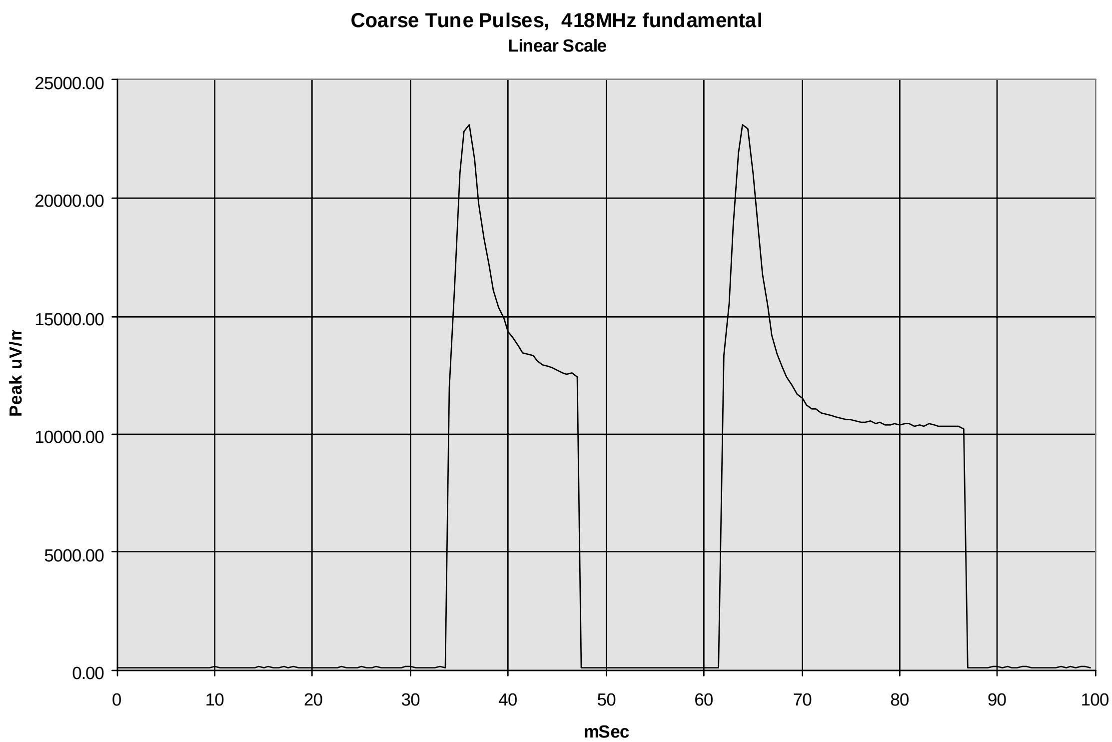
   Formula 3: Average Field Intensity

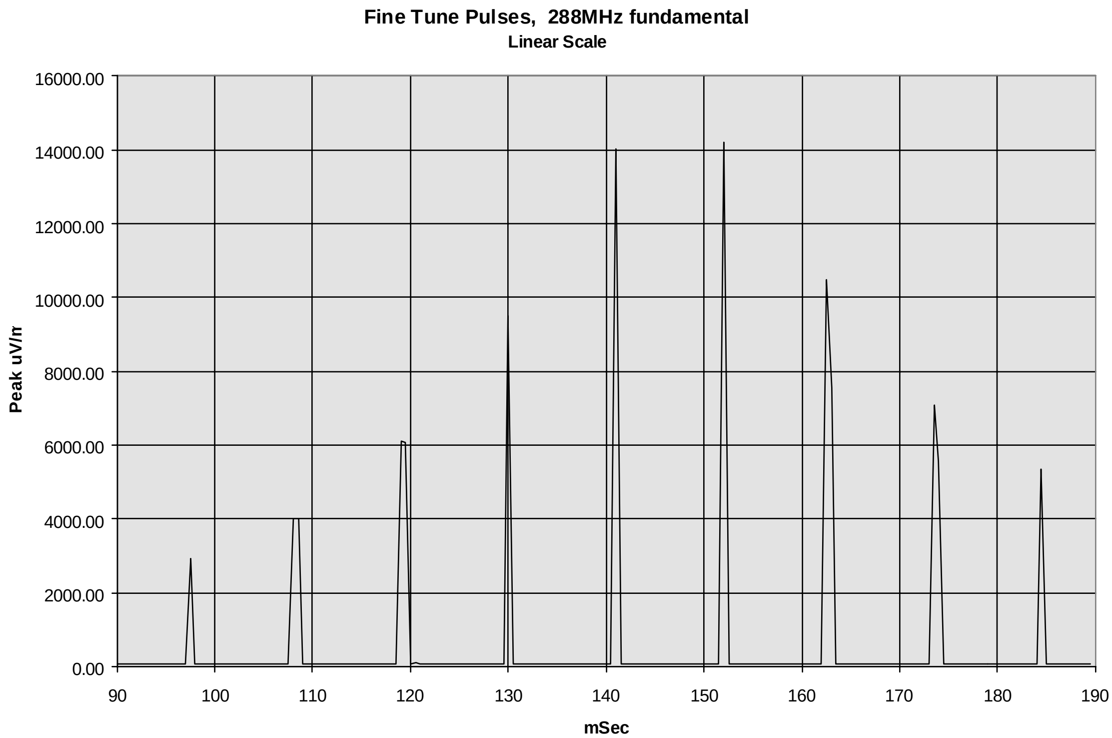
$$\text{Avg. F.I.} = \frac{\displaystyle\sum_{n=1}^{\text{no. of data pts}} (\text{Level}_n)\text{uV/m}}{(\text{number of data points})}$$

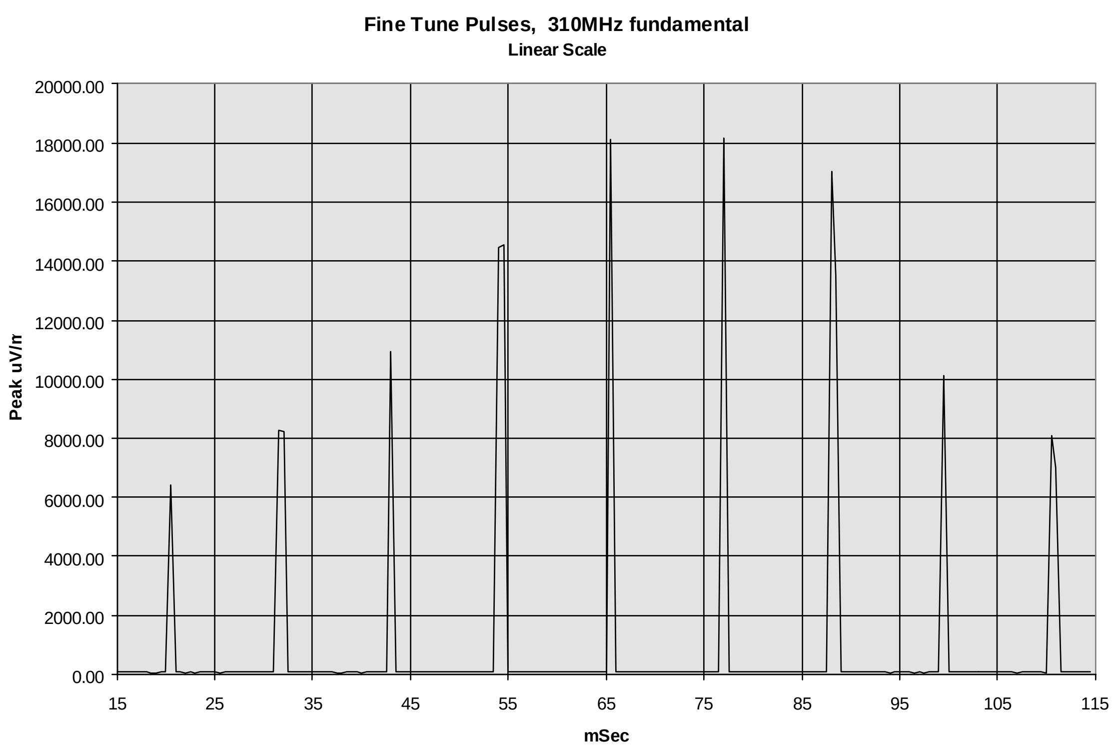
The charts that follow are the reproduction of the coarse tune pulse traces using number of data points representing 100mSec sweep time from the screen display of the HP8546A EMI receiver.

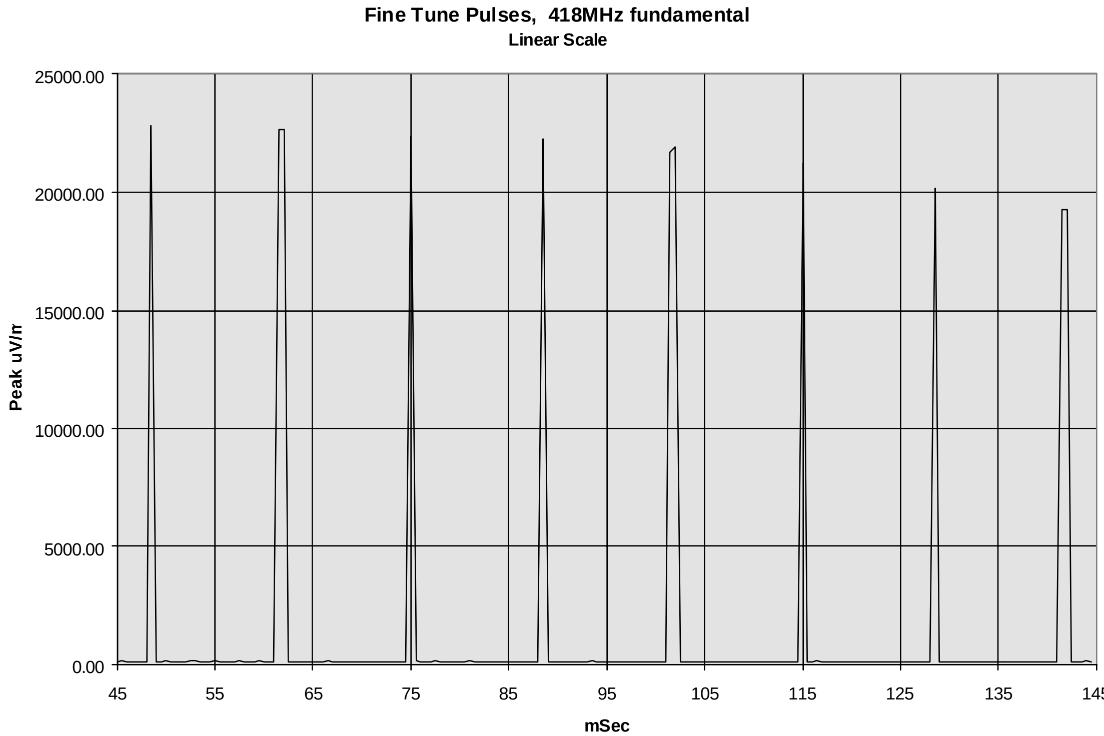



Coarse Tune Pulses, 310MHz fundamental
Linear Scale
Peak uV/m
mSec
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
100
110
120
130
140
150
160
170
180
190
200


Coarse Tune Pulses, 418MHz fundamental
Linear Scale
Peak uV/m
mSec
25000.00
20000.00
15000.00
10000.00
5000.00
0.00
0
10
20
30
40
50
60
70
80
90
100


Fine Tune Pulses, 288MHz fundamental
Linear Scale
Peak uV/m
mSec


Fine Tune Pulses, 310MHz fundamental
Linear Scale
Peak uV/m
mSec



The raw data used in calculating the average field intensity of the tuning pulses is available upon request.

COARSE TUNE PULSES, Calculated average over 100mSec

TX Freq. (MHz)	SUM of the levels of all data points in 100mSec span (uV/m)	Number of Data points in 100mSec span N	Average SUM/N (uV/m)	LIMIT (uV/m)	Delta Limit (dB)
288	286,015	200	1430	4917	**-10.7**
310	504,007	200	2520	5833	**-7.3**
418	1,054,790	200	5274	10333	**-5.8**

FINE TUNE PULSES, Calculated average over 100mSec

TX Freq. (MHz)	SUM of the levels of all data points in 100mSec span (uV/m)	Number of Data points in 100mSec span N	Average SUM/N (uV/m)	LIMIT (uV/m)	Delta Limit (dB)
288	109,642	200	548	4917	**-19.1**
310	168,693	200	843	5833	**-16.8**
418	260,006	200	1300	10333	**-18.0**