

# AHD

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

### Test Report for FCC ID: NZLCTHL3 FCC Part 2.1031, Part 15 Subpart C(15.231)

Report #0100479F  
Issued 03/19/02



### **MODEL NZLCTHL3** **NVS<sup>U</sup> MIRROR WITH HOMELINK<sup>®</sup> III TRANSMITTER,** **ELECTRONIC COMPASS, & TEMPERATURE**

Prepared for:

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Zeeland, MI 49464

Test Date(s): November 12-14, 2001

data recorded by

witnessed by



Ted Chaffee, NCE  
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This report prepared by:



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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

### **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:  $\pm 1.4$  dB

**Manufacturer/Applicant [2.1033(b1)]**

The manufacturer and applicant:

GENTEX CORPORATION  
600 N. Centennial St.  
Zeeland, Michigan 49464

**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
Compliance Design B1000	B100	A10101	24-Aug-01	36 months
Compliance Design B1000	B200	A10102	24-Aug-01	36 months
Compliance Design B1000	B300	A10103	24-Aug-01	36 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	12 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%.

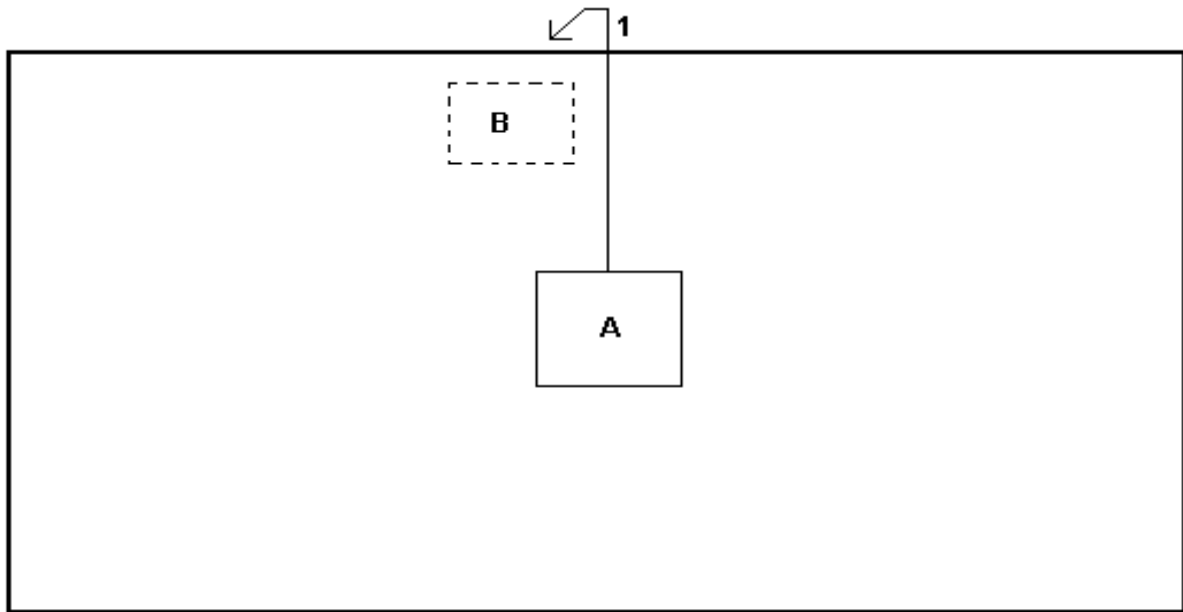
## Tested Configuration /Setup: [2.1033(b8)]

### Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] NVS <sub>v</sub> Mirror with Homelink <sup>®</sup> Garage Door Opener	[GENTEX] NZLCTHL3	605-1349	FCC ID: NZLCTHL3
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.



setup\_11

**BASIC EUT SETUP**  
 (Legend designation is above)

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## 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 system tested is compliant to the requirement of CFR 47, FCC Part 15, SubPart B as a digital device.
4. The equipment under test was received on November 12, 2001 and this test series commenced on November 12, 2001.
5. The line conducted emission testing does not apply to this product. The device is powered from a 12 volt automobile source only.
6. 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.
7. Occupied Band Width of the transmitted signal, at the 20dB point, nearest the limit occurred with the EUT transmitting at 288MHz with a pulse modulation of 50% duty cycle. The occupied bandwidth was measured to be 540KHz. This measurement is within the allowed 720KHz bandwidth. The greatest value of occupied bandwidth occurred with the EUT transmitting at 310MHz with a pulse modulation of 80% duty cycle. The occupied bandwidth was measured to be 56KHz. This measurement is within the allowed 775KHz bandwidth.
8. The preliminary scan for spurious emissions conducted in a shielded room indicated low level spurious signals.
9. The digital spurious emissions, indicated in the pre-scan, were all at or below the background noise of the OATS. The level of background noise nearest the limit, occurred at 91.5MHz. The quasi-peak level was measured to be 24.7dBuV/m which is 18.8dB below the FCC Class B limit.

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**Summary of Results continued:**

10. 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 30% duty cycle. The EUT was positioned on the 'end' and the receive antenna oriented in the vertical polarization. This signal was measured to be 0.8dB below the limit of 80.3dBuV/m (10,333uV/m).
11. The evaluation of the field strength levels of the harmonics showed the emission nearest the limit occurred while operating at 288MHz with 500Hz pulsed modulation at 30% duty cycle. The EUT was positioned on the 'end'; and the receive antenna oriented in the horizontal polarization. This signal, at 576MHz, was measured to be 9.7dB below the limit of 53.8dBuV/m (490uV/m).
12. The average value of the coarse tune pulses over a 100mSec time, nearest the limit, occurred at 418MHz. The average measurement was determined to be 7903uV/m which is 2.3dB below the limit of 10,333uV/m..
13. The average value of the fine tune pulses over a 100mSec time, nearest the limit, occurred at 418MHz. The average measurement was determined to be 1883uV/m which is 14.8dB below the limit of 10,333uV/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 Universal Garage Door Opener Transmitter was installed in the automotive rearview mirror 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.



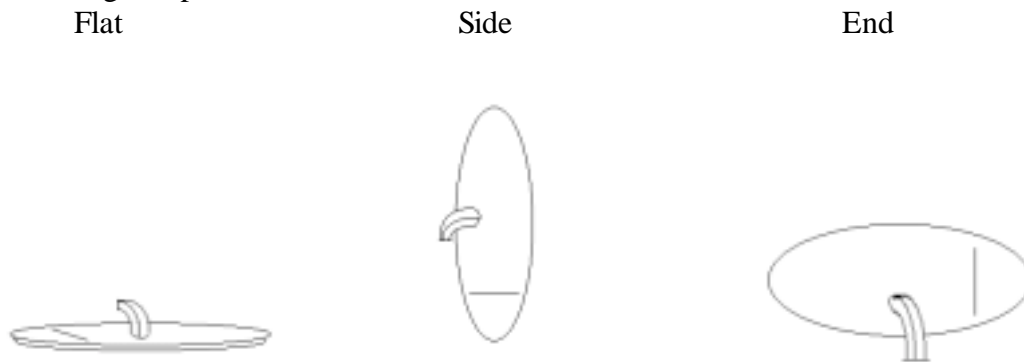
During the evaluation the EUT was transmitting continuously.

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:



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**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: 
$$FS(\text{dBuV/m}) = RF(\text{dBuV}) + AF(\text{dB/m}) + CF(\text{dB})$$

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: 
$$\text{Average Level}(\text{uV/m}) = [\text{Peak Level}(\text{uV/m})] \times [\text{duty cycle factor}]$$

Formula 2a: 
$$\text{Average Level}(\text{dBuV/m}) = \text{Peak Level}(\text{dBuV/m}) + \text{duty cycle factor}(\text{dB})$$

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

For 30% (0.30): 
$$\text{duty cycle factor}(\text{dB}) = 20 * \text{Log}(0.3) = -10.46$$

For 50% (0.50): 
$$\text{duty cycle factor}(\text{dB}) = 20 * \text{Log}(0.5) = -6.02$$

For 80% (0.80): 
$$\text{duty cycle factor}(\text{dB}) = 20 * \text{Log}(0.8) = -1.94$$

As an example:

A measured peak level of 50% duty cycle pulse modulated signal is 500uV/m.

Calculated to dBuV/m is  $20 * \text{Log}(500) = 53.98 \text{dBuV/m}$  Peak level.

Applying the duty cycle factor:  $\text{Avg. Level}(\text{dBuV/m}) = 53.98 - 6.02 \text{dB} = 47.96 \text{dBuV/m}$ .

## 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:

$$\begin{aligned} 288\text{MHz} \quad & (288 - 260) / (470 - 260) = (L_0 - 3750) / (12500 - 3750) \\ & (28 / 210) * (8750) = L_0 - 3750 \\ & L_0 = 1166.7 + 3750 \\ & L_0 = 4916.7 \text{ uV/m is LIMIT at 288MHz} \end{aligned}$$

$$\begin{aligned} 310\text{MHz} \quad & (310 - 260) / (470 - 260) = (L_0 - 3750) / (12500 - 3750) \\ & (50 / 210) * (8750) = L_0 - 3750 \\ & L_0 = 2083.3 + 3750 \\ & L_0 = 5833.3 \text{ uV/m is LIMIT at 310MHz} \end{aligned}$$

$$\begin{aligned} 418\text{MHz} \quad & (418 - 260) / (470 - 260) = (L_0 - 3750) / (12500 - 3750) \\ & (158 / 210) * (8750) = L_0 - 3750 \\ & L_0 = 6583.3 + 3750 \\ & L_0 = 10333.3 \text{ uV/m is LIMIT at 418MHz} \end{aligned}$$

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

$$288\text{MHz} \quad \text{dB limit is } 20 * \text{LOG}(4916.7 \text{ uV/m}) = 73.8 \text{ dBuV/m}$$

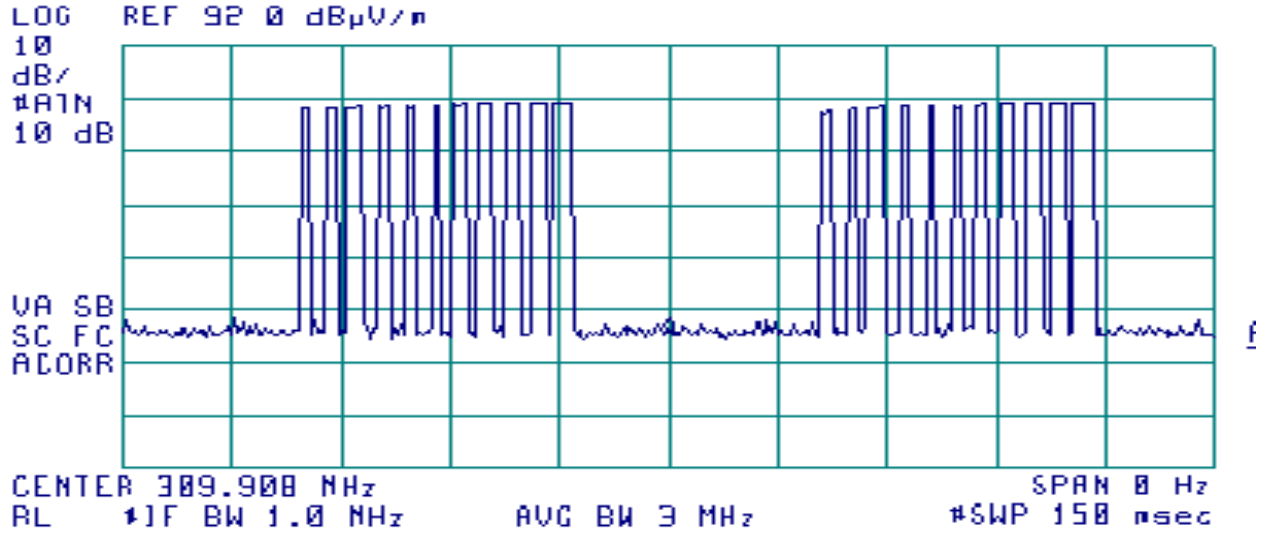
$$310\text{MHz} \quad \text{dB limit is } 20 * \text{LOG}(5833.3 \text{ uV/m}) = 75.3 \text{ dBuV/m}$$

$$418\text{MHz} \quad \text{dB limit is } 20 * \text{LOG}(10333.3 \text{ uV/m}) = 80.3 \text{ dBuV/m}$$

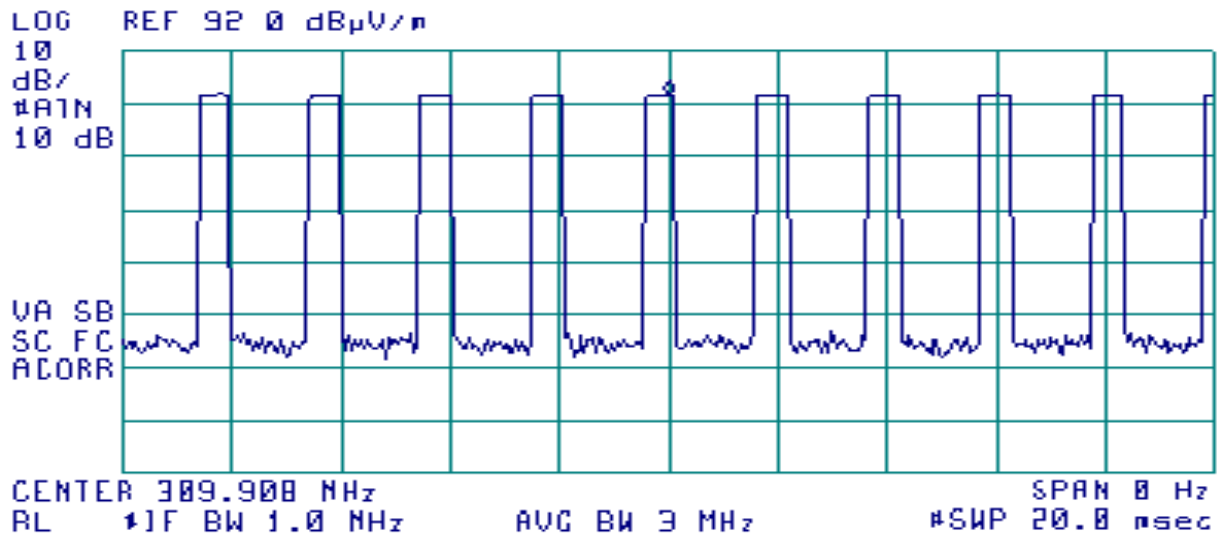
### Test Data [2.1033(b6)]

#### Modulation Characteristics

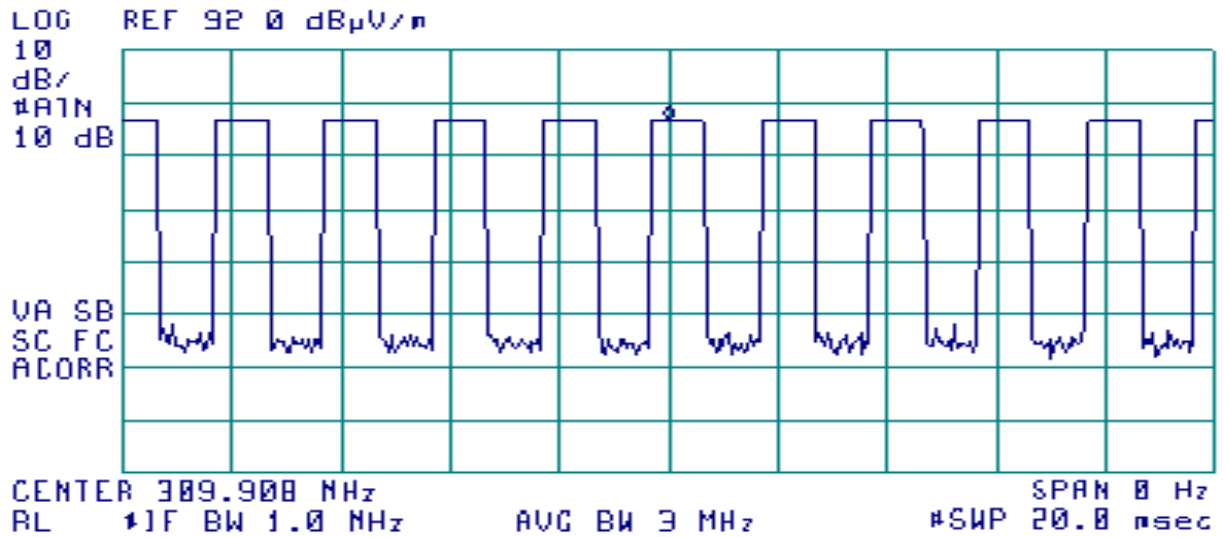
Typical encoding at 310MHz: Consisting of pulses of differing duty cycles.



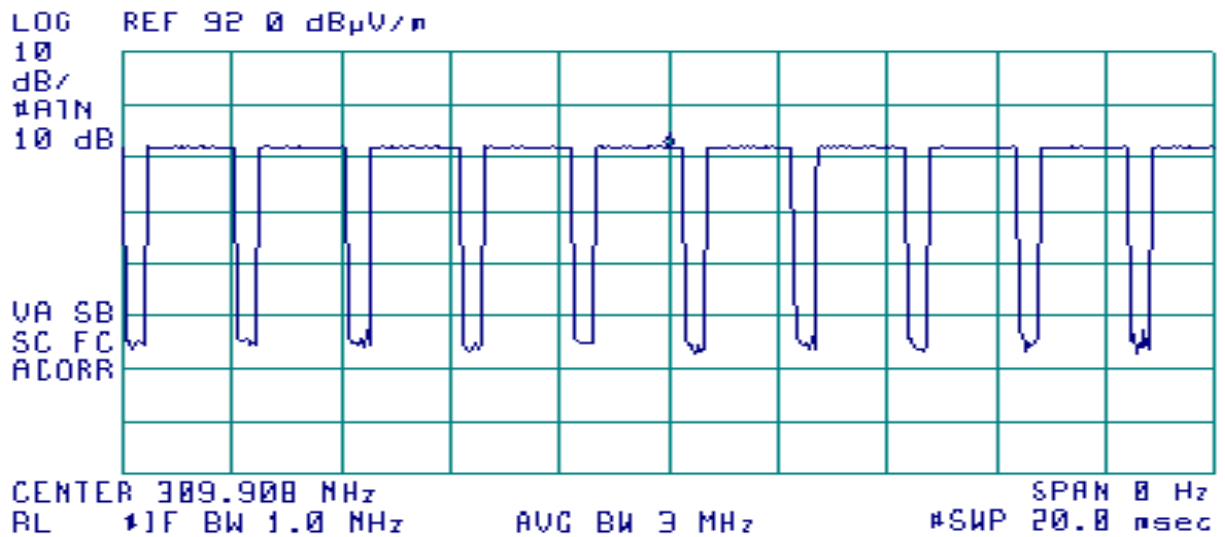
310MHz, 500Hz Modulation, 30% duty cycle



310MHz, 500Hz Modulation, 50% duty cycle



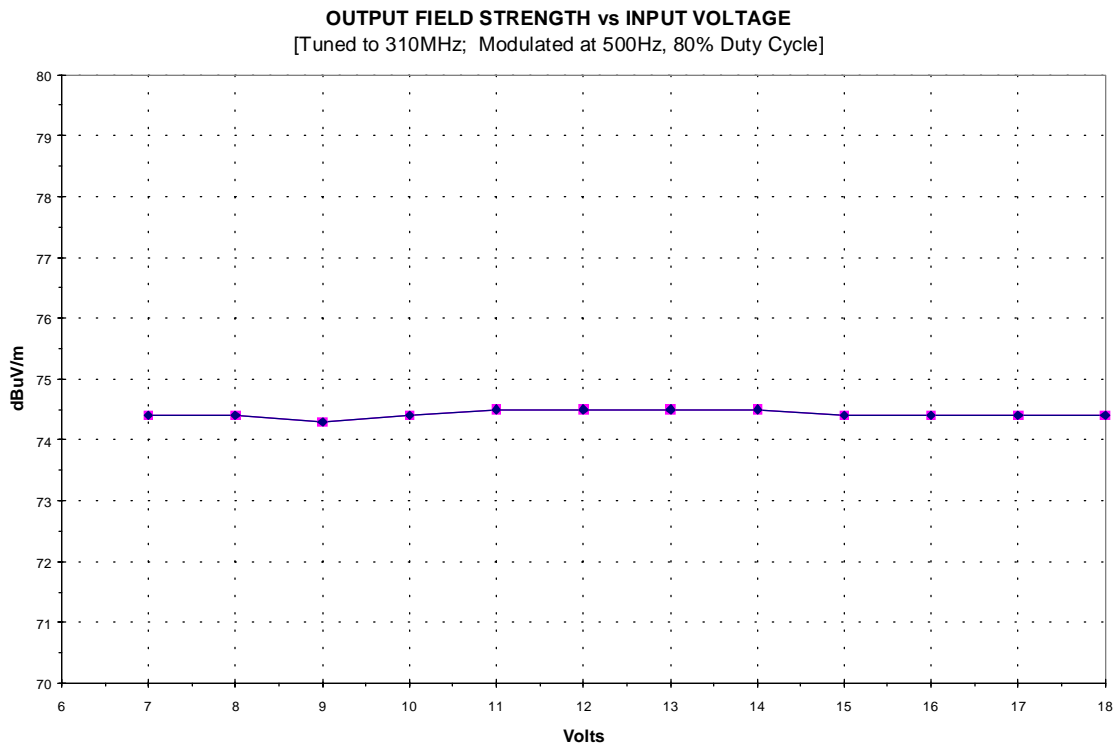
310MHz, 500Hz Modulation, 80% duty cycle



**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= NZLCTHL3, 310MHz, 30%duty cycle	
Volt In	TX OutPut Pk dBuV/m
6	NoOperation
7	74.4
8	74.4
9	74.3
10	74.4
11	74.5
12	74.5
13	74.5
14	74.5
15	74.4
16	74.4
17	74.4
18	74.4



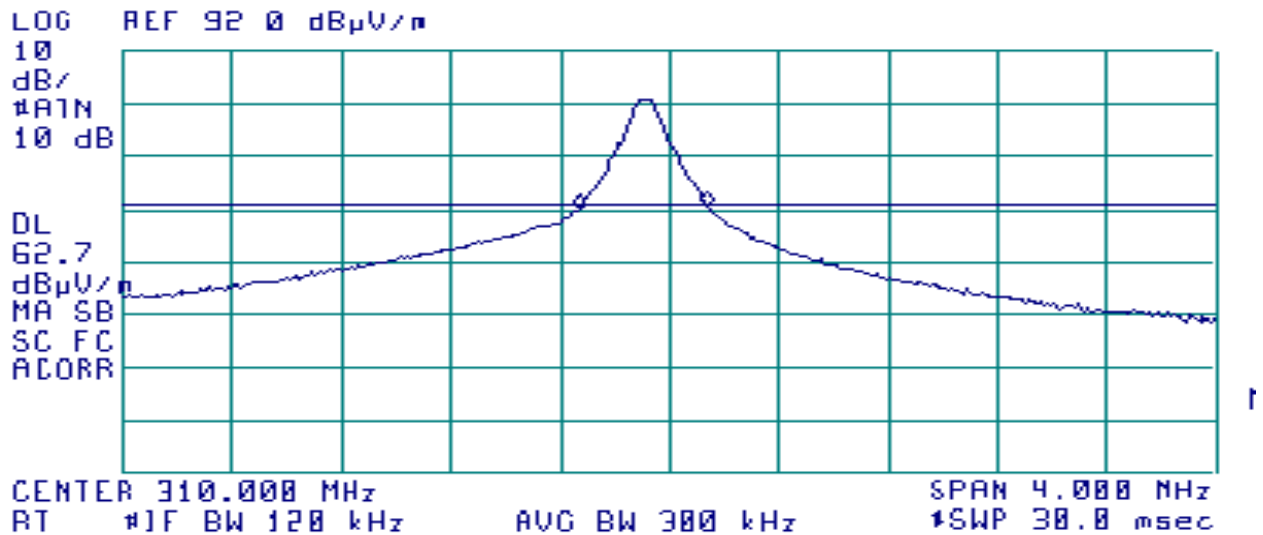
**Occupied Bandwidth [15.231(c)]**

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%	503 KHz	720 KHz
“	50%	540 KHz	720 KHz
“	80%	503 KHz	720 KHz
310	30%	495 KHz	775 KHz
“	50%	525 KHz	775 KHz
“	80%	563 KHz	775 KHz
418	30%	533 KHz	1045 KHz
“	50%	525 KHz	1045 KHz
“	80%	495 KHz	1045 KHz

This chart shows a typical 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 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.



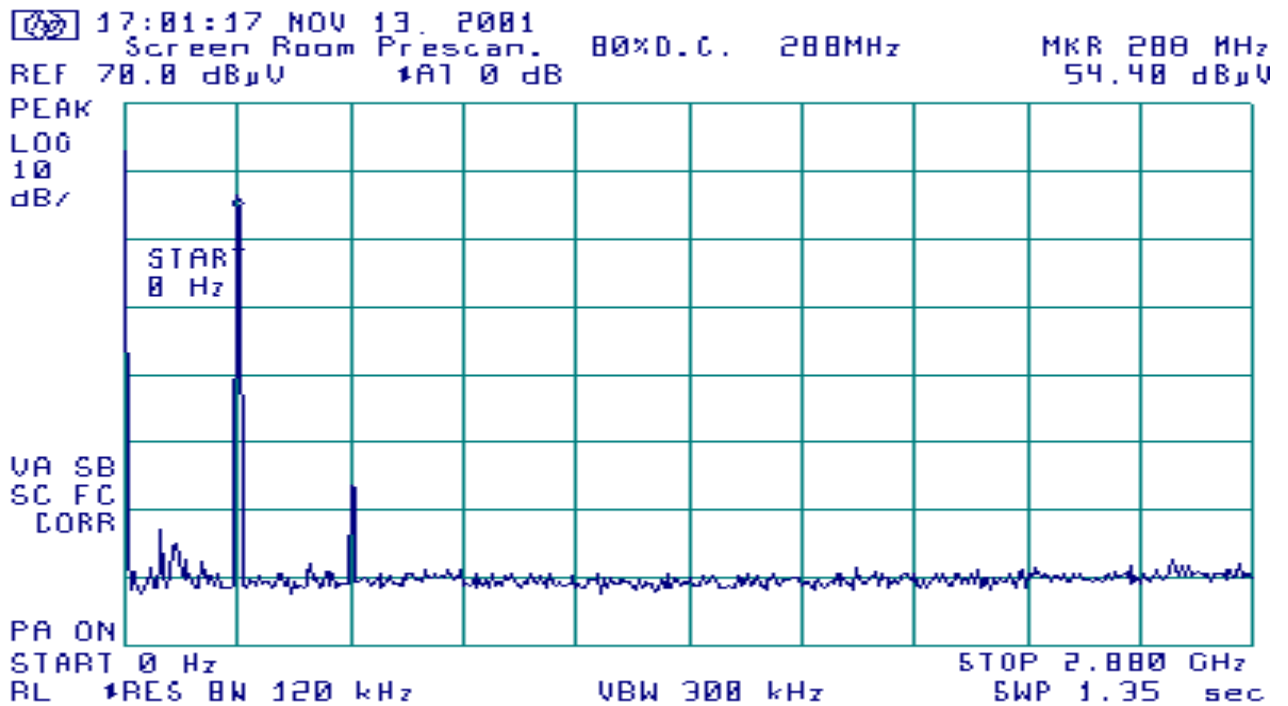
### Radiated Field Strength Measurements: [15.231(b), 15.205]

A scan of the NZLCTHL3 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.

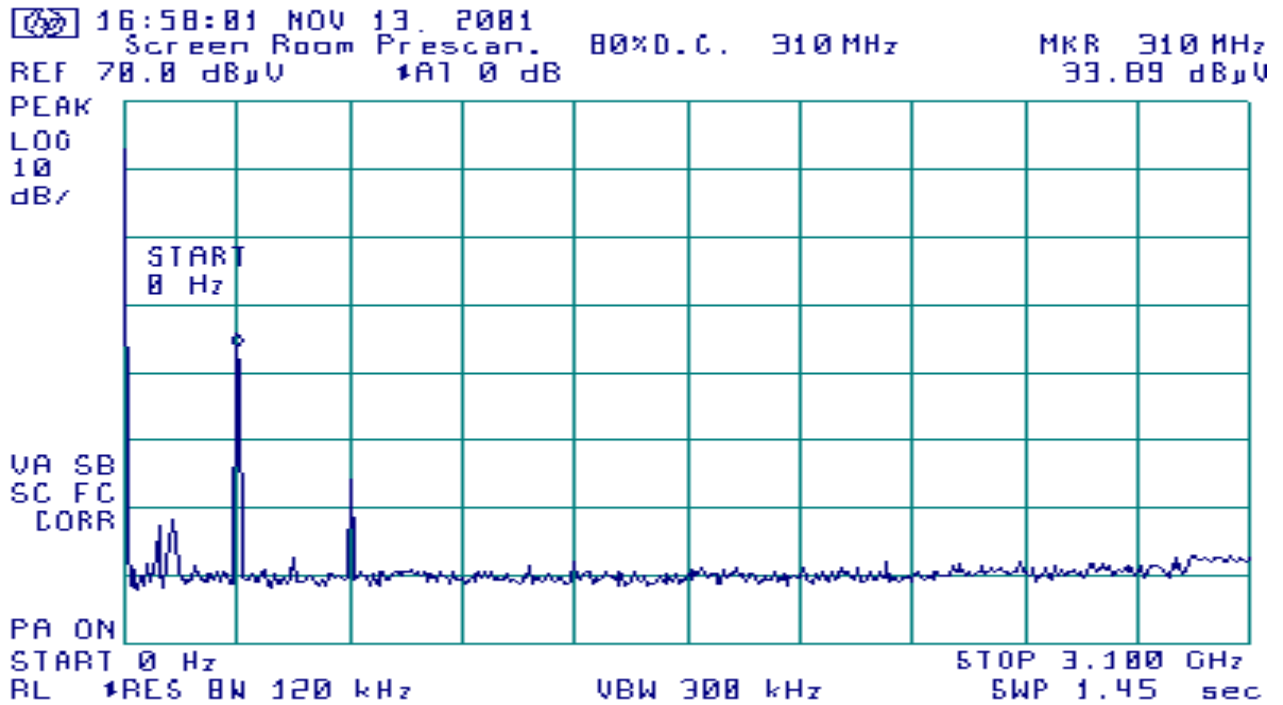
These suspect signals were then measured at the 3-meter open area test site.

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.

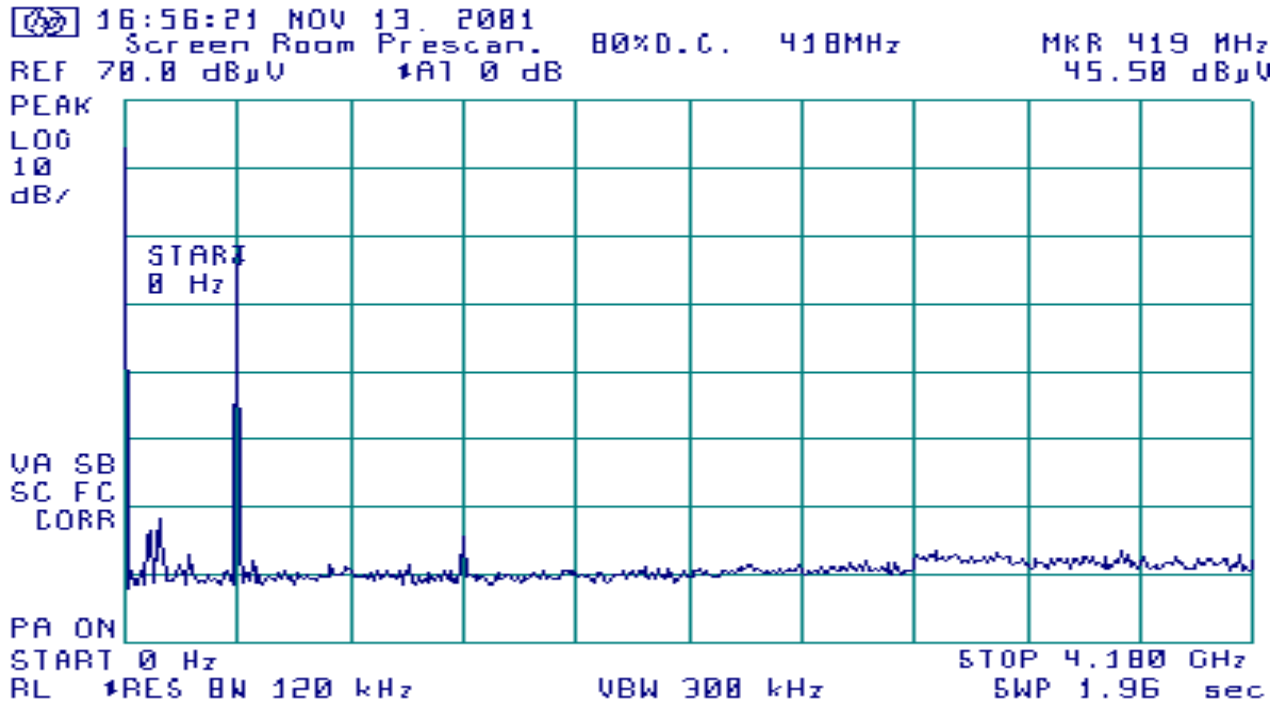
EUT trained to 288MHz operation



EUT trained to 310MHz operation

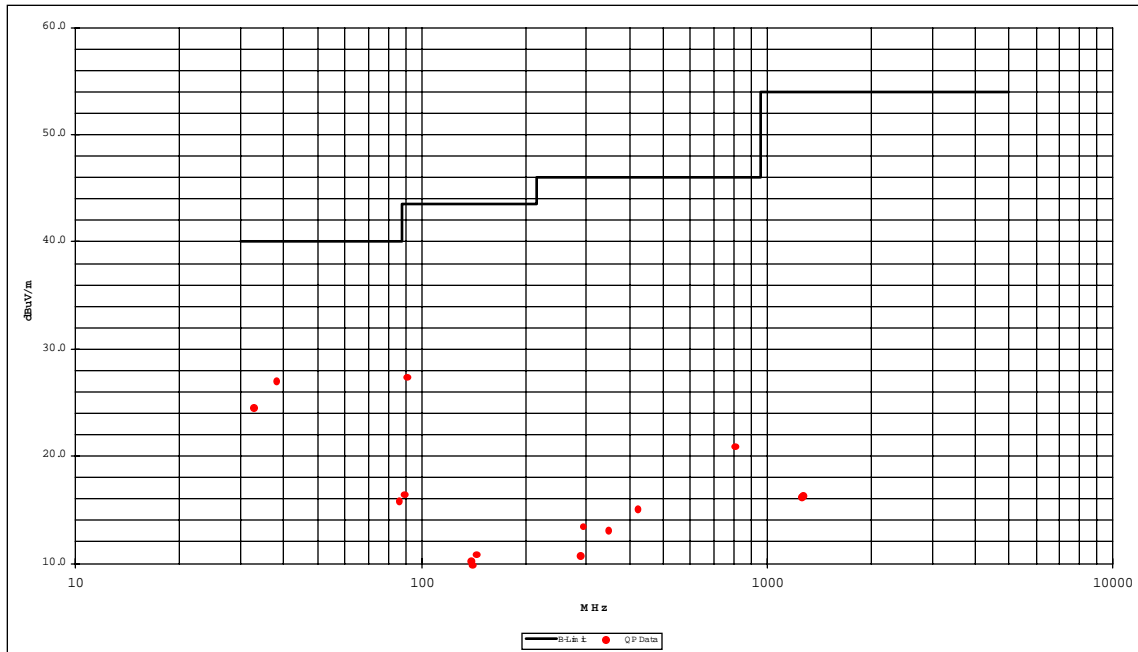


EUT trained to 418MHz operation.



### Radiated Field Strength Measurements

Graph of Quasi-Peak Measurements



Tabulated Quasi-Peak Measurements.

Frequency MHz	Polarity	Quasi Peak Measurement dBuV/m	Included Cable+Antenna Factors dB+dB/m	FCC Class B Limit dBuV/m	Margin dB
**60.00	V	19.86	8.62	40.00	-20.14
**79.84	H	8.73	7.67	40.00	-31.27
**80.17	V	19.36	7.68	40.00	-20.64
**88.50	V	20.76	8.06	43.50	-22.74
**91.50	H	24.71	8.36	43.50	-18.79
**117.98	V	21.24	8.76	43.50	-22.26
**121.50	V	10.14	8.53	43.50	-33.36
**125.95	V	6.30	8.26	43.50	-37.20
**135.00	V	12.37	8.37	43.50	-31.13
**194.77	V	11.33	12.07	43.50	-32.17

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.	DUT position	Ant. Pol.	Corrected Data Peak Detector	Duty Cycle	Duty Cycle Factor	Calculated Average Level	FCC Limit	Margin	Cable +Ant. Factor
MHz			dBuV/m	%	dB	dBuV/m	dBuV/m	dB	dB+dB/m
288	side	H	81.8	30%	-10.46	71.3	73.8	<b>2.5</b>	14.7
"	"	"	76.5	50%	-6.02	70.5	73.8	<b>3.3</b>	"
"	"	"	71.9	80%	-1.94	70.0	73.8	<b>3.8</b>	"

**DUT Tuned to transmit at 310MHz**

Freq.	DUT position	Ant. Pol.	Corrected Data Peak Detector	Duty Cycle	Duty Cycle Factor	Calculated Average Level	FCC Limit	Margin	Cable +Ant. Factor
MHz			dBuV/m	%	dB	dBuV/m	dBuV/m	dB	dB+dB/m
310	side	H	83.1	30%	-10.46	72.6	75.3	<b>2.7</b>	15.1
"	"	"	77.5	50%	-6.02	71.5	75.3	<b>3.8</b>	"
"	"	"	72.7	80%	-1.94	70.8	75.3	<b>4.5</b>	"

**DUT Tuned to transmit at 418MHz**

Freq.	DUT position	Ant. Pol.	Corrected Data Peak Detector	Duty Cycle	Duty Cycle Factor	Calculated Average Level	FCC Limit	Margin	Cable +Ant. Factor
MHz			dBuV/m	%	dB	dBuV/m	dBuV/m	dB	dB+dB/m
418	end	V	90.0	30%	-10.46	79.5	80.3	<b>0.8</b>	18.3
"	-	"	84.9	50%	-6.02	78.9	80.3	<b>1.4</b>	"
"	-	"	81.2	80%	-1.94	79.3	80.3	<b>1.0</b>	"

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

DUT Tuned to transmit at 288MHz

576	end	H	54.6	30%	-10.46	44.1	53.8	<b>9.7</b>	21.4
"	"	"	47.3	50%	-6.02	41.3	53.8	<b>12.5</b>	"
"	"	"	38.6	80%	-1.94	36.7	53.8	<b>17.1</b>	"
864	side	V	35.0	30%	-10.46	24.5	53.8	<b>29.3</b>	25.3
"	"	"	35.4	50%	-6.02	29.4	53.8	<b>24.4</b>	"
"	"	"	33.0	80%	-1.94	31.1	53.8	<b>22.7</b>	"
1152	-	V	37 noise floor	30%	-10.46	<26.5	54.0	<b>&gt;27.5</b>	28.7
"	-	"	37 noise floor	50%	-6.02	<31.0	54.0	<b>&gt;23.0</b>	"
"	-	"	37 noise floor	80%	-1.94	<35.1	54.0	<b>&gt;18.9</b>	"
1440	flat	V	40.2	30%	-10.46	29.7	54.0	<b>24.3</b>	29.4
"	"	"	40.4	50%	-6.02	34.4	54.0	<b>19.6</b>	"
"	"	"	39.6	80%	-1.94	37.7	54.0	<b>16.3</b>	"
1728	flat	V	38.7	30%	-10.46	28.2	54.0	<b>25.8</b>	30.3
"	"	"	37 noise floor	50%	-6.02	<31.0	54.0	<b>&gt;23.0</b>	"
"	"	"	37 noise floor	80%	-1.94	<35.1	54.0	<b>&gt;18.9</b>	"
2016	-	V	39 noise floor	30%	-10.46	<28.5	54.0	<b>&gt;25.5</b>	31.2
"	-	"	39 noise floor	50%	-6.02	<33.0	54.0	<b>&gt;21.0</b>	"
"	-	"	39 noise floor	80%	-1.94	<37.1	54.0	<b>&gt;16.9</b>	"
2304	-	V	40 noise floor	30%	-10.46	<29.5	54.0	<b>&gt;24.5</b>	32.3
"	-	"	40 noise floor	50%	-6.02	<34.0	54.0	<b>&gt;20.0</b>	"
"	-	"	40 noise floor	80%	-1.94	<38.1	54.0	<b>&gt;15.9</b>	"
2592	-	V	41 noise floor	30%	-10.46	<30.5	54.0	<b>&gt;23.5</b>	33.1
"	-	"	41 noise floor	50%	-6.02	<35.0	54.0	<b>&gt;19.0</b>	"
"	-	"	41 noise floor	80%	-1.94	<39.1	54.0	<b>&gt;14.9</b>	"
2880	-	V	41 noise floor	30%	-10.46	<30.5	54.0	<b>&gt;23.5</b>	33.3
"	-	"	41 noise floor	50%	-6.02	<35.0	54.0	<b>&gt;19.0</b>	"
"	-	"	41 noise floor	80%	-1.94	<39.1	54.0	<b>&gt;14.9</b>	"

## DUT Tuned to transmit at 310MHz

MHz			dBuV/m	%	dB	dBuV/m	dBuV/m	dB	dB+dB/m
620	side	H	54.6	30%	-10.46	44.1	55.3	<b>11.2</b>	22.1
"	"	"	49.3	50%	-6.02	43.3	55.3	<b>12.0</b>	"
"	"	"	41.2	80%	-1.94	39.3	55.3	<b>16.0</b>	"
930	flat	H	38.2 in ambient	30%	-10.46	<27.7	55.3	> <b>27.6</b>	25.8
"	"	"	37.1 in ambient	50%	-6.02	<31.1	55.3	> <b>24.2</b>	"
"	"	"	36.2 in ambient	80%	-1.94	<34.3	55.3	> <b>21.0</b>	"
1240	flat	V	40.6	30%	-10.46	30.1	54.0	<b>23.9</b>	29.0
"	side	"	37.8	50%	-6.02	31.8	54.0	<b>22.2</b>	"
"	"	"	37.4	80%	-1.94	35.5	54.0	<b>18.5</b>	"
1550	end	V	43.2	30%	-10.46	32.7	54.0	<b>21.3</b>	29.7
"	"	"	41.2	50%	-6.02	35.2	54.0	<b>18.8</b>	"
"	flat	"	40.2	80%	-1.94	38.3	54.0	<b>15.7</b>	"
1860	end	V	40.8	30%	-10.46	30.3	55.3	<b>25.0</b>	30.7
"	-	"	38 noise floor	50%	-6.02	<32.0	55.3	> <b>23.3</b>	"
"	-	"	38 noise floor	80%	-1.94	<36.1	55.3	> <b>19.2</b>	"
2170	end	V	41.1	30%	-10.46	30.6	55.3	<b>24.7</b>	31.8
"	-	"	39.9	50%	-6.02	33.9	55.3	<b>21.4</b>	"
"	-	"	38 noise floor	80%	-1.94	<36.1	55.3	> <b>19.2</b>	"
2480	-	V	41 noise floor	30%	-10.46	<30.5	55.3	> <b>24.8</b>	32.9
"	-	"	41 noise floor	50%	-6.02	<35.0	55.3	> <b>20.3</b>	"
"	-	"	41 noise floor	80%	-1.94	<39.0	55.3	> <b>16.3</b>	"
2790	-	V	41 noise floor	30%	-10.46	<31.5	54.0	> <b>22.5</b>	33.2
"	-	"	41 noise floor	50%	-6.02	<36.0	54.0	> <b>18.0</b>	"
"	-	"	41 noise floor	80%	-1.94	<40.0	54.0	> <b>14.0</b>	"
3100	-	V	40 noise floor	30%	-10.46	<30.5	54.0	> <b>23.5</b>	33.7
"	-	"	40 noise floor	50%	-6.02	<35.0	54.0	> <b>19.0</b>	"
"	-	"	40 noise floor	80%	-1.94	<39.0	54.0	> <b>15.0</b>	"

## 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	Margin dB	Cable +Ant. Factor dB+dB/m
836	end	H	49.2	30%	-10.46	38.7	60.3	<b>21.6</b>	25.0
"	"	"	41.6	50%	-6.02	35.6	60.3	<b>24.7</b>	"
"	"	"	37.9	80%	-1.94	36.0	60.3	<b>24.3</b>	"
1254	side	V	43.0	30%	-10.46	32.5	54.0	<b>21.5</b>	29.0
"	"	"	44.1	50%	-6.02	38.1	54.0	<b>15.9</b>	"
"	"	"	44.7	80%	-1.94	42.8	54.0	<b>11.2</b>	"
1672	side	V	45.1	30%	-10.46	34.6	54.0	<b>19.4</b>	30.1
"	"	"	42.2	50%	-6.02	36.2	54.0	<b>17.8</b>	"
"	"	"	41.9	80%	-1.94	40.0	54.0	<b>14.0</b>	"
2090	flat	V	42.8	30%	-10.46	32.3	60.3	<b>28.0</b>	31.5
"	"	"	42.7	50%	-6.02	36.7	60.3	<b>23.6</b>	"
"	"	"	42.4	80%	-1.94	40.5	60.3	<b>19.8</b>	"
2508	side	V	41 noise floor	30%	-10.46	<30.5	60.3	<b>&gt;29.8</b>	33.0
"	-	"	41 noise floor	50%	-6.02	<35.0	60.3	<b>&gt;25.3</b>	"
"	-	"	41 noise floor	80%	-1.94	<39.1	60.3	<b>&gt;21.2</b>	"
2926	-	V	41 noise floor	30%	-10.46	<30.5	60.3	<b>&gt;29.8</b>	33.3
"	-	"	41 noise floor	50%	-6.02	<35.0	60.3	<b>&gt;25.3</b>	"
"	-	"	41 noise floor	80%	-1.94	<39.1	60.3	<b>&gt;21.2</b>	"
3344	-	V	41 noise floor	30%	-10.46	<30.5	60.3	<b>&gt;29.8</b>	34.4
"	-	"	41 noise floor	50%	-6.02	<35.0	60.3	<b>&gt;25.3</b>	"
"	-	"	41 noise floor	80%	-1.94	<39.1	60.3	<b>&gt;21.2</b>	"
3762	-	V	42 noise floor	30%	-10.46	<31.5	54.0	<b>&gt;22.5</b>	34.8
"	-	"	42 noise floor	50%	-6.02	<36.0	54.0	<b>&gt;18.0</b>	"
"	-	"	42 noise floor	80%	-1.94	<40.1	54.0	<b>&gt;13.9</b>	"
4180	-	V	41 noise floor	30%	-10.46	<30.5	54.0	<b>&gt;23.5</b>	35.0
"	-	"	41 noise floor	50%	-6.02	<35.0	54.0	<b>&gt;19.0</b>	"
"	-	"	41 noise floor	80%	-1.94	<39.1	54.0	<b>&gt;14.9</b>	"

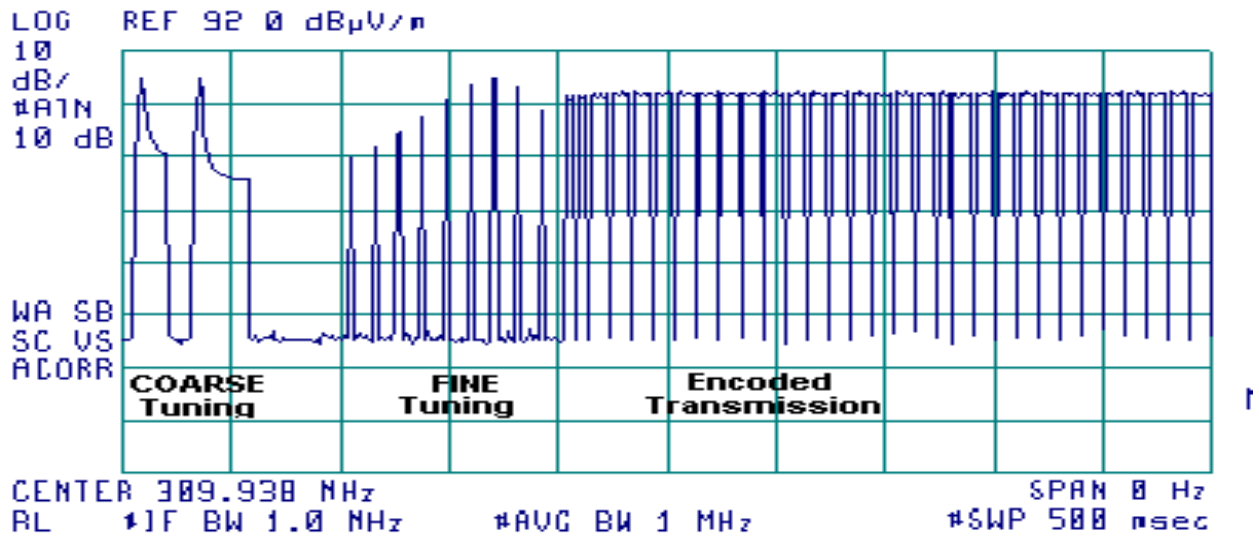
### Calculation of Field Strength of Tuning Pulses: [15.231(b)], 15.31(c)]

The tuning pulses are generated each time the NZLCTHL3 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).

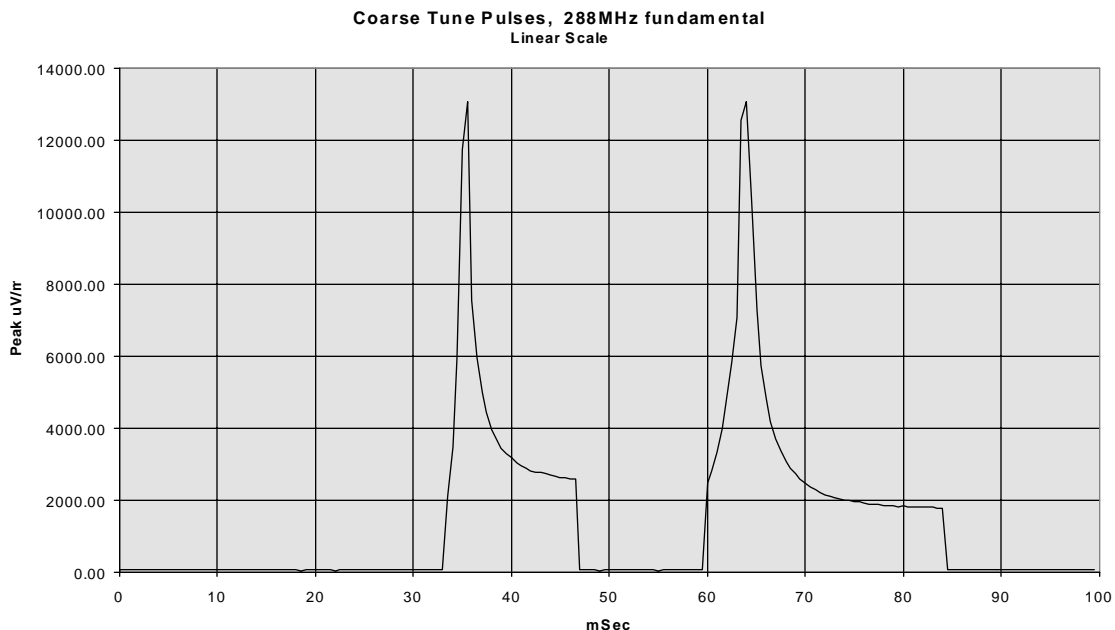
Example: If the scan rate is set at 200mSec, then the number of data points per 100mSec is 100mSec \* (400pts / 200mSec) = 200 pts.

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.

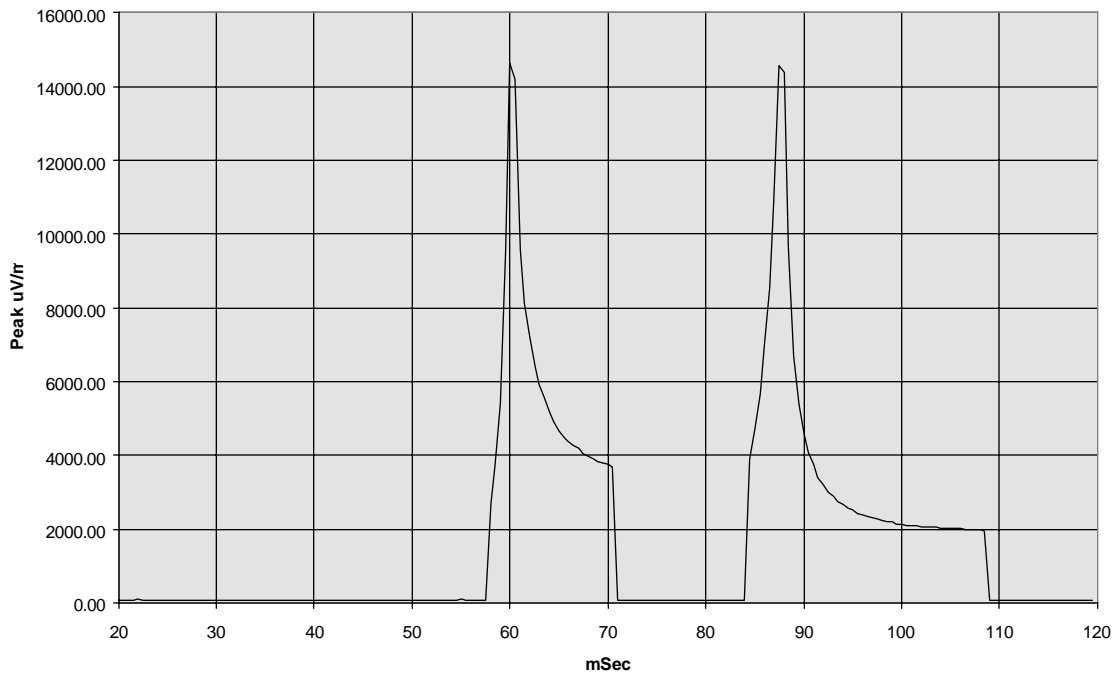
Formula 3: Average Field Intensity

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

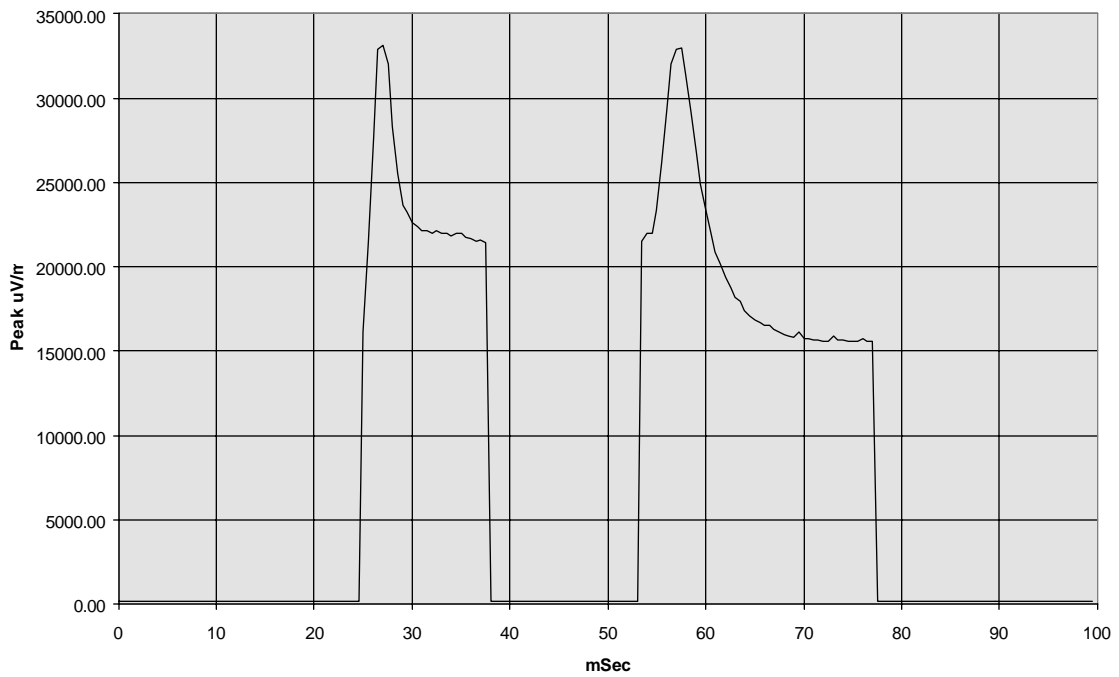
The charts that follow are the reproduction of the coarse tune pulse traces using number of data points representing 100mSec sweep time from the screen display of the HP8546A EMI receiver.



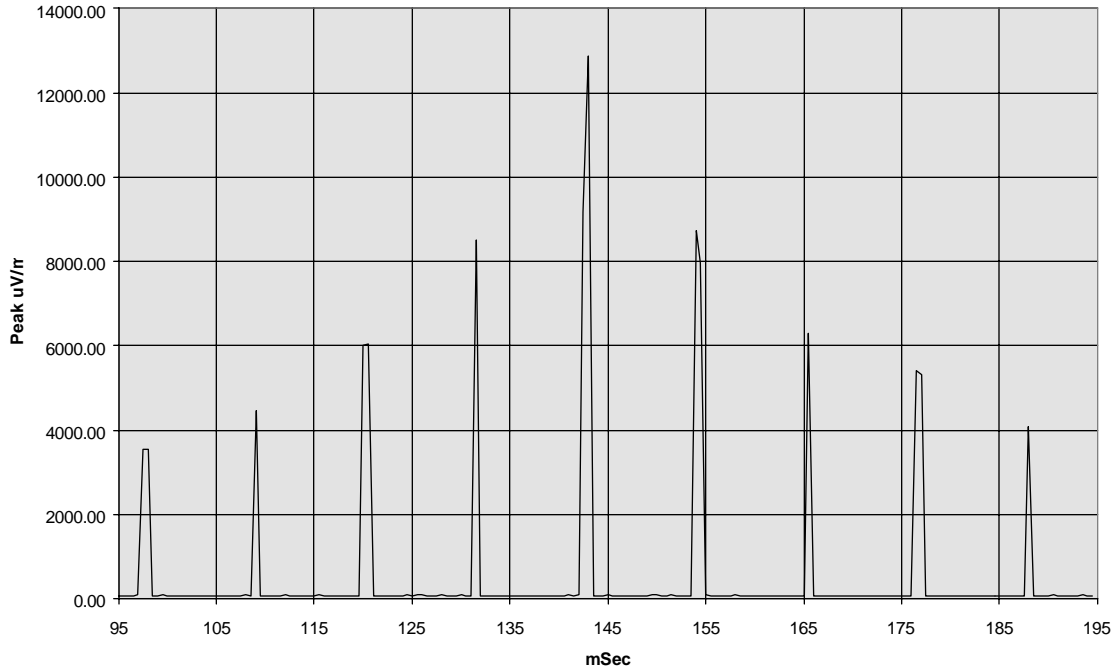
**Coarse Tune Pulses, 310MHz fundamental**  
Linear Scale



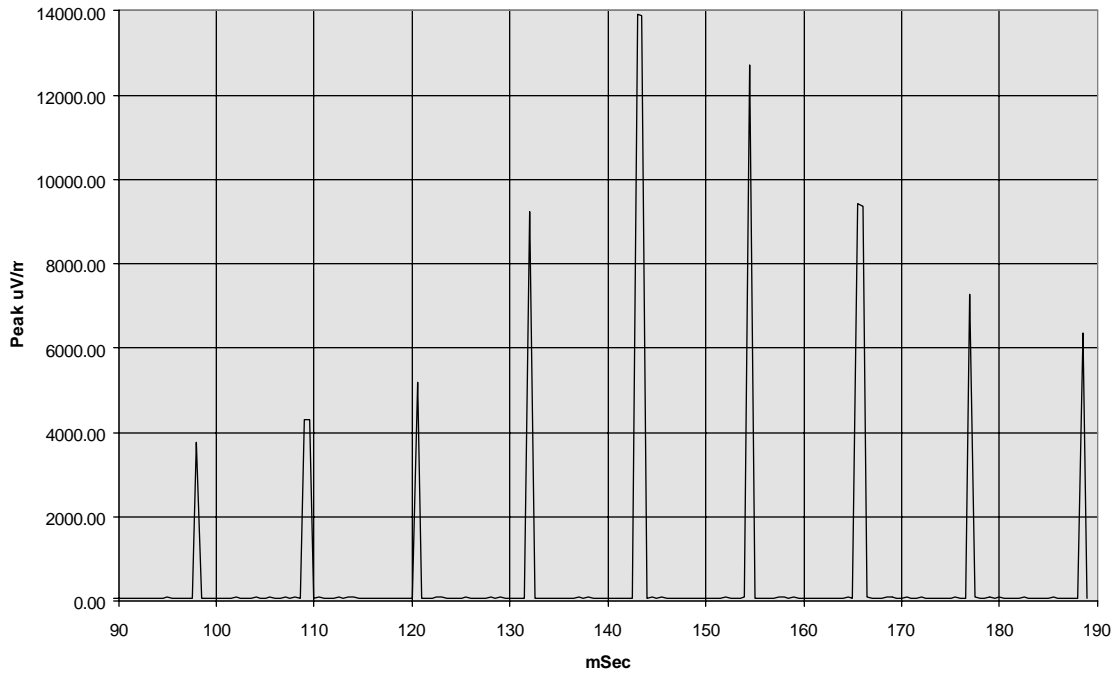
**Coarse Tune Pulses, 418MHz fundamental**  
Linear Scale

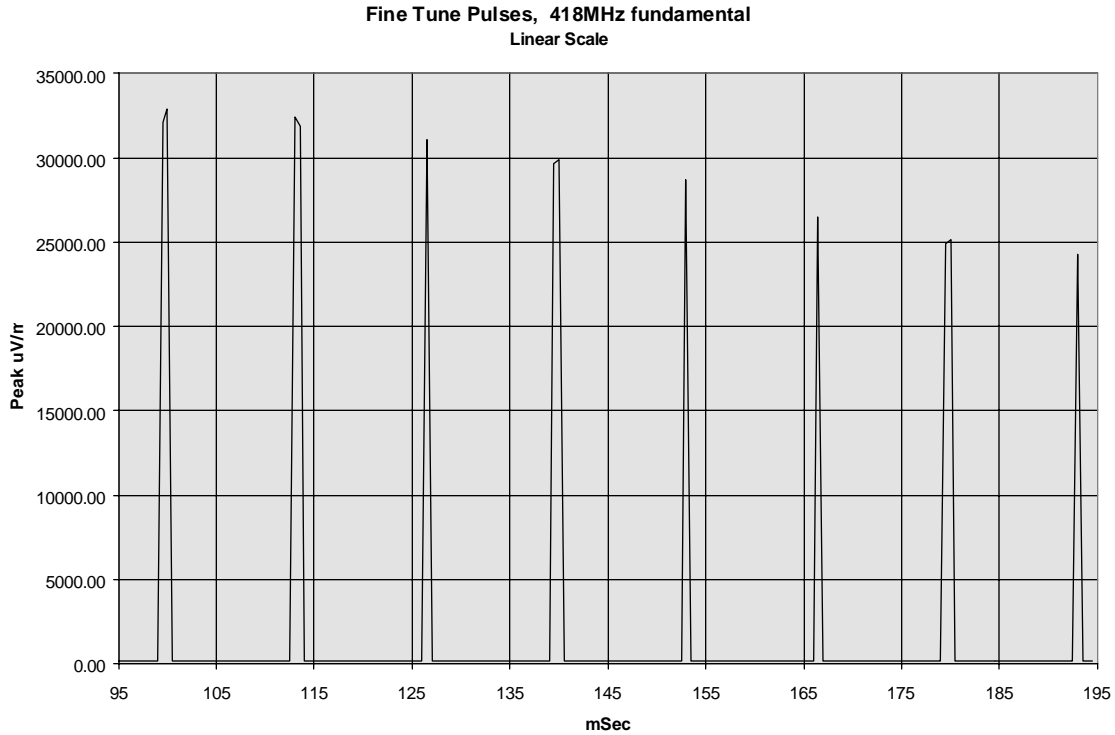


**Fine Tune Pulses, 288MHz fundamental**  
Linear Scale



**Fine Tune Pulses, 310MHz fundamental**  
Linear Scale





The raw data used in calculating the average field intensity of the tuning pulses are presented in the Appendix of this test report.

**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)	MARGIN (dB)
288	285,428	200	1427	4917	<b>10.7</b>
310	345,374	200	1727	5833	<b>10.6</b>
418	1,580,586	200	7903	10333	<b>2.3</b>

**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)	MARGIN (dB)
288	104,974	200	525	4917	<b>19.4</b>
310	113,750	200	569	5833	<b>20.2</b>
418	376,519	200	1883	10333	<b>14.8</b>

**APPENDIX: Tune Pulses - Data Details**

COARSE TUNE Pulse; Fundamental Frequency = 288MHz

	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m
1	0	70.23	25	76.21	50	61.31	75	1970.15
2	0.5	76.56	25.5	75.77	50.5	70.06	75.5	1956.59
3	1	78.89	26	74.22	51	74.56	76	1916.46
4	1.5	70.79	26.5	77.45	51.5	70.63	76.5	1909.85
5	2	69.26	27	71.20	52	69.66	77	1881.48
6	2.5	76.03	27.5	68.00	52.5	66.76	77.5	1890.17
7	3	65.01	28	68.16	53	65.69	78	1859.94
8	3.5	66.07	28.5	66.07	53.5	71.20	78.5	1870.68
9	4	69.10	29	66.07	54	68.39	79	1859.94
10	4.5	84.72	29.5	62.59	54.5	65.01	79.5	1830.21
11	5	83.08	30	66.91	55	57.81	80	1845.02
12	5.5	79.34	30.5	63.10	55.5	70.23	80.5	1819.70
13	6	78.70	31	73.03	56	66.22	81	1815.52
14	6.5	74.82	31.5	65.69	56.5	67.30	81.5	1805.09
15	7	86.70	32	63.24	57	69.26	82	1819.70
16	7.5	67.84	32.5	73.03	57.5	69.66	82.5	1805.09
17	8	72.03	33	85.80	58	62.45	83	1805.09
18	8.5	67.14	33.5	2103.78	58.5	63.46	83.5	1796.80
19	9	77.18	34	3487.39	59	63.75	84	1796.80
20	9.5	81.47	34.5	5977.23	59.5	67.69	84.5	64.27
21	10	65.54	35	11762.51	60	2471.72	85	62.95
22	10.5	78.43	35.5	13076.76	60.5	2828.13	85.5	72.03
23	11	73.37	36	7568.33	61	3326.60	86	69.66
24	11.5	66.22	36.5	5963.48	61.5	3990.25	86.5	79.52
25	12	73.96	37	5023.43	62	4786.30	87	65.54
26	12.5	61.16	37.5	4436.09	62.5	5834.45	87.5	68.16
27	13	70.06	38	3981.07	63	7095.78	88	75.42
28	13.5	62.45	38.5	3689.78	63.5	12560.30	88.5	61.02
29	14	77.62	39	3451.44	64	13076.76	89	70.23
30	14.5	60.81	39.5	3315.13	64.5	10303.86	89.5	63.75
31	15	64.64	40	3191.54	65	7311.39	90	65.69
32	15.5	64.27	40.5	3054.92	65.5	5741.16	90.5	67.69
33	16	86.00	41	2968.25	66	4836.15	91	66.76
34	16.5	64.64	41.5	2907.37	66.5	4207.27	91.5	62.59
35	17	64.64	42	2837.92	67	3728.21	92	71.20
36	17.5	68.39	42.5	2773.32	67.5	3388.44	92.5	75.77
37	18	68.39	43	2779.71	68	3079.64	93	77.62
38	18.5	58.95	43.5	2735.27	68.5	2884.03	93.5	67.14
39	19	70.06	44	2713.31	69	2735.27	94	62.59
40	19.5	69.50	44.5	2657.66	69.5	2594.18	94.5	70.39
41	20	75.60	45	2630.27	70	2471.72	95	70.06
42	20.5	66.76	45.5	2621.20	70.5	2376.84	95.5	67.45
43	21	74.82	46	2615.17	71	2285.60	96	73.20
44	21.5	77.45	46.5	2588.21	71.5	2231.00	96.5	76.56
45	22	59.09	47	70.39	72	2170.20	97	74.22
46	22.5	72.03	47.5	72.44	72.5	2118.36	97.5	72.19
47	23	67.84	48	71.86	73	2079.70	98	61.66
48	23.5	61.16	48.5	69.82	73.5	2046.44	98.5	66.07
49	24	79.52	49	58.95	74	2018.37	99	68.00
50	24.5	71.20	49.5	68.16	74.5	2025.35	99.5	71.20

## COARSE TUNE Pulse; Fundamental Frequency = 310MHz

	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m
1	20	66.22	45	66.76	70	3745.42	95	2520.58
2	20.5	64.34	45.5	66.60	70.5	3702.54	95.5	2432.20
3	21	74.22	46	63.10	71	75.42	96	2393.32
4	21.5	78.25	46.5	76.38	71.5	73.03	96.5	2333.46
5	22	93.86	47	76.03	72	72.28	97	2309.40
6	22.5	72.61	47.5	84.72	72.5	69.74	97.5	2272.48
7	23	84.72	48	79.80	73	73.03	98	2225.87
8	23.5	68.00	48.5	74.56	73.5	66.37	98.5	2195.33
9	24	83.75	49	67.84	74	74.56	99	2190.28
10	24.5	75.16	49.5	81.85	74.5	70.71	99.5	2147.83
11	25	71.29	50	65.69	75	73.62	100	2147.83
12	25.5	79.98	50.5	72.86	75.5	69.74	100.5	2091.70
13	26	69.98	51	64.86	76	70.71	101	2103.78
14	26.5	77.00	51.5	77.45	76.5	64.34	101.5	2103.78
15	27	84.43	52	79.98	77	77.89	102	2074.91
16	27.5	82.89	52.5	71.29	77.5	69.74	102.5	2053.53
17	28	72.03	53	69.42	78	73.79	103	2063.00
18	28.5	72.86	53.5	74.56	78.5	72.28	103.5	2046.44
19	29	67.69	54	76.65	79	69.18	104	2030.02
20	29.5	68.79	54.5	75.60	79.5	71.70	104.5	2013.72
21	30	76.21	55	95.61	80	70.55	105	2009.09
22	30.5	69.74	55.5	74.22	80.5	72.61	105.5	2030.02
23	31	71.29	56	83.37	81	78.07	106	2004.47
24	31.5	79.52	56.5	89.74	81.5	79.80	106.5	1997.56
25	32	74.56	57	70.31	82	67.84	107	1988.38
26	32.5	69.98	57.5	69.42	82.5	77.62	107.5	1992.97
27	33	67.14	58	2700.85	83	76.82	108	1981.53
28	33.5	73.96	58.5	3723.92	83.5	74.39	108.5	1945.36
29	34	85.80	59	5401.32	84	74.99	109	68.94
30	34.5	76.65	59.5	9594.01	84.5	3899.42	109.5	66.60
31	35	64.86	60	14638.62	85	4726.07	110	70.15
32	35.5	73.20	60.5	14223.29	85.5	5681.98	110.5	78.89
33	36	79.80	61	9594.01	86	6966.27	111	73.96
34	36.5	78.70	61.5	8147.04	86.5	8521.19	111.5	73.96
35	37	84.72	62	7211.07	87	10851.76	112	75.16
36	37.5	65.69	62.5	6449.11	87.5	14571.36	112.5	79.98
37	38	67.14	63	5915.62	88	14371.43	113	82.04
38	38.5	72.61	63.5	5565.45	88.5	9638.29	113.5	70.71
39	39	71.29	64	5188.00	89	6675.75	114	71.12
40	39.5	81.19	64.5	4903.43	89.5	5388.90	114.5	68.23
41	40	67.84	65	4671.97	90	4560.37	115	76.03
42	40.5	70.15	65.5	4497.80	90.5	4097.32	115.5	77.89
43	41	68.39	66	4380.26	91	3745.42	116	81.19
44	41.5	65.84	66.5	4260.89	91.5	3408.00	116.5	71.86
45	42	67.45	67	4183.12	92	3213.66	117	79.80
46	42.5	67.45	67.5	4050.42	92.5	3009.54	117.5	74.56
47	43	71.86	68	3985.66	93	2884.03	118	71.86
48	43.5	68.00	68.5	3899.42	93.5	2741.57	118.5	67.30
49	44	77.27	69	3845.92	94	2663.79	119	72.28
50	44.5	65.84	69.5	3784.43	94.5	2579.29	119.5	72.28

## COARSE TUNE Pulse; Fundamental Frequency = 418MHz

	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m
1	0	151.71	25	16162.18	50	138.84	75	15613.49
2	0.5	127.64	25.5	21428.91	50.5	159.59	75.5	15613.49
3	1	139.64	26	27669.42	51	160.51	76	15739.83
4	1.5	136.62	26.5	32885.16	51.5	141.58	76.5	15613.49
5	2	145.71	27	33151.26	52	151.01	77	15613.49
6	2.5	127.35	27.5	32062.69	52.5	151.36	77.5	136.30
7	3	160.51	28	28346.54	53	139.96	78	139.64
8	3.5	144.54	28.5	25527.01	53.5	21552.62	78.5	136.62
9	4	149.62	29	23659.20	54	21953.31	79	123.74
10	4.5	132.28	29.5	23227.37	54.5	21953.31	79.5	137.72
11	5	141.91	30	22594.36	55	23334.58	80	129.72
12	5.5	125.31	30.5	22413.00	55.5	26151.70	80.5	135.83
13	6	129.72	31	22130.95	56	29410.34	81	130.17
14	6.5	161.25	31.5	22181.96	56.5	32062.69	81.5	152.93
15	7	138.84	32	22003.92	57	32885.16	82	144.88
16	7.5	140.77	32.5	22181.96	57.5	32960.97	82.5	154.17
17	8	123.03	33	22003.92	58	31368.95	83	133.66
18	8.5	124.74	33.5	21953.31	58.5	29174.27	83.5	135.52
19	9	133.05	34	21827.30	59	26791.68	84	135.21
20	9.5	121.76	34.5	21953.31	59.5	24917.24	84.5	141.09
21	10	130.17	35	21953.31	60	23415.31	85	142.56
22	10.5	128.38	35.5	21777.10	60.5	22003.92	85.5	121.34
23	11	143.38	36	21652.10	61	20868.92	86	125.03
24	11.5	129.42	36.5	21552.62	61.5	20183.66	86.5	130.47
25	12	144.21	37	21602.30	62	19386.53	87	161.62
26	12.5	130.17	37.5	21428.91	62.5	18749.95	87.5	142.56
27	13	123.03	38	135.21	63	18197.01	88	155.42
28	13.5	152.23	38.5	148.08	63.5	17968.01	88.5	160.14
29	14	132.59	39	141.09	64	17398.03	89	137.72
30	14.5	134.74	39.5	157.58	64.5	17080.48	89.5	136.30
31	15	146.05	40	137.40	65	16846.12	90	154.17
32	15.5	141.91	40.5	140.77	65.5	16672.47	90.5	136.62
33	16	139.16	41	161.62	66	16557.70	91	133.66
34	16.5	133.05	41.5	163.31	66.5	16519.62	91.5	135.52
35	17	136.30	42	137.72	67	16292.96	92	121.34
36	17.5	141.09	42.5	168.27	67.5	16125.01	92.5	134.74
37	18	129.12	43	152.58	68	15995.58	93	125.03
38	18.5	131.52	43.5	152.58	68.5	15903.77	93.5	135.52
39	19	129.42	44	158.49	69	15812.48	94	133.35
40	19.5	122.04	44.5	131.98	69.5	16125.01	94.5	139.64
41	20	133.05	45	126.77	70	15739.83	95	154.17
42	20.5	137.40	45.5	144.54	70.5	15739.83	95.5	138.84
43	21	130.47	46	159.22	71	15685.56	96	144.21
44	21.5	129.42	46.5	135.21	71.5	15649.48	96.5	146.55
45	22	147.23	47	160.88	72	15613.49	97	124.02
46	22.5	143.71	47.5	139.16	72.5	15613.49	97.5	149.62
47	23	143.05	48	160.14	73	15867.19	98	156.31
48	23.5	134.43	48.5	153.46	73.5	15649.48	98.5	128.38
49	24	150.14	49	146.05	74	15649.48	99	139.64
50	24.5	124.31	49.5	157.22	74.5	15559.66	99.5	124.74

FINE TUNE Pulses; Fundamental Frequency = 288MHz

	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m
1	95	65.69	120	5997.91	145	89.13	170	66.91
2	95.5	70.39	120.5	6039.49	145.5	72.78	170.5	70.96
3	96	74.22	121	63.10	146	75.42	171	66.07
4	96.5	60.19	121.5	67.30	146.5	75.16	171.5	68.71
5	97	79.34	122	60.81	147	70.63	172	70.39
6	97.5	3535.90	122.5	68.16	147.5	74.82	172.5	58.95
7	98	3527.77	123	64.79	148	71.86	173	66.76
8	98.5	61.52	123.5	63.24	148.5	68.00	173.5	66.37
9	99	67.45	124	66.07	149	74.56	174	69.50
10	99.5	80.17	124.5	80.35	149.5	95.94	174.5	61.66
11	100	66.91	125	69.82	150	88.61	175	58.48
12	100.5	65.69	125.5	84.24	150.5	67.45	175.5	67.30
13	101	75.60	126	81.66	151	78.89	176	69.10
14	101.5	76.38	126.5	65.01	151.5	79.34	176.5	5401.32
15	102	66.76	127	71.37	152	65.31	177	5302.74
16	102.5	66.37	127.5	62.95	152.5	74.39	177.5	64.64
17	103	68.00	128	86.00	153	68.94	178	73.62
18	103.5	63.46	128.5	74.56	153.5	71.61	178.5	67.84
19	104	62.59	129	72.03	154	8729.71	179	74.56
20	104.5	72.44	129.5	66.76	154.5	7961.59	179.5	66.37
21	105	65.54	130	81.00	155	84.43	180	76.56
22	105.5	66.76	130.5	65.01	155.5	75.77	180.5	66.07
23	106	64.64	131	68.16	156	67.69	181	69.82
24	106.5	60.81	131.5	8521.19	156.5	68.00	181.5	65.54
25	107	67.14	132	69.82	157	72.44	182	60.19
26	107.5	69.82	132.5	61.73	157.5	65.54	182.5	66.22
27	108	80.82	133	69.50	158	82.60	183	60.81
28	108.5	71.20	133.5	74.99	158.5	72.03	183.5	74.82
29	109	4461.70	134	68.00	159	64.12	184	64.49
30	109.5	74.39	134.5	68.16	159.5	72.19	184.5	69.26
31	110	66.91	135	78.70	160	70.79	185	69.66
32	110.5	68.55	135.5	76.56	160.5	67.30	185.5	67.30
33	111	62.45	136	68.71	161	66.07	186	69.82
34	111.5	63.10	136.5	69.26	161.5	65.16	186.5	68.39
35	112	80.63	137	74.56	162	73.79	187	63.46
36	112.5	65.16	137.5	64.64	162.5	77.00	187.5	78.70
37	113	73.37	138	69.26	163	73.03	188	4069.12
38	113.5	67.69	138.5	78.07	163.5	71.86	188.5	67.84
39	114	61.73	139	73.79	164	70.63	189	70.39
40	114.5	68.16	139.5	71.61	164.5	78.25	189.5	67.45
41	115	69.26	140	67.30	165	65.84	190	73.96
42	115.5	80.35	140.5	69.66	165.5	6287.82	190.5	80.35
43	116	73.62	141	83.56	166	68.00	191	72.44
44	116.5	68.55	141.5	68.39	166.5	62.59	191.5	69.82
45	117	65.31	142	85.11	167	70.23	192	66.76
46	117.5	69.26	142.5	9183.33	167.5	65.31	192.5	74.82
47	118	67.45	143	12867.67	168	62.45	193	73.20
48	118.5	74.22	143.5	63.10	168.5	73.03	193.5	80.63
49	119	66.60	144	75.16	169	69.26	194	72.78
50	119.5	66.22	144.5	72.61	169.5	67.30	194.5	64.12



FINE TUNE Pulses; Fundamental Frequency = 310MHz

	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m
1	89.5	75.42	114.5	74.82	139.5	78.25	164.5	79.80
2	90	67.69	115	77.00	140	76.82	165	64.49
3	90.5	67.45	115.5	70.15	140.5	71.70	165.5	9440.61
4	91	69.98	116	74.39	141	68.94	166	9364.83
5	91.5	71.29	116.5	63.31	141.5	77.62	166.5	79.52
6	92	71.12	117	74.82	142	72.28	167	70.88
7	92.5	71.29	117.5	72.61	142.5	77.89	167.5	71.70
8	93	72.44	118	69.98	143	13915.54	168	71.70
9	93.5	63.61	118.5	68.94	143.5	13883.53	168.5	83.75
10	94	65.84	119	70.31	144	75.77	169	95.94
11	94.5	67.14	119.5	69.58	144.5	84.72	169.5	75.77
12	95	82.22	120	66.22	145	72.61	170	71.45
13	95.5	77.62	120.5	5199.96	145.5	84.04	170.5	81.85
14	96	72.44	121	72.03	146	66.60	171	72.44
15	96.5	72.44	121.5	72.03	146.5	71.29	171.5	71.70
16	97	73.45	122	73.79	147	70.55	172	98.51
17	97.5	77.27	122.5	81.38	147.5	76.82	172.5	66.76
18	98	3762.70	123	80.72	148	72.03	173	73.20
19	98.5	70.88	123.5	70.31	148.5	67.45	173.5	77.00
20	99	77.00	124	70.55	149	71.45	174	78.70
21	99.5	72.44	124.5	73.79	149.5	73.79	174.5	70.88
22	100	69.74	125	66.37	150	70.31	175	70.55
23	100.5	75.77	125.5	79.52	150.5	76.38	175.5	89.02
24	101	70.31	126	71.45	151	68.39	176	70.71
25	101.5	69.18	126.5	73.45	151.5	78.70	176.5	70.31
26	102	80.91	127	73.79	152	81.19	177	7269.42
27	102.5	75.60	127.5	73.79	152.5	71.12	177.5	81.56
28	103	77.27	128	84.04	153	72.44	178	70.55
29	103.5	70.55	128.5	69.42	153.5	77.00	178.5	76.38
30	104	79.16	129	87.10	154	84.24	179	90.16
31	104.5	71.12	129.5	73.45	154.5	12705.74	179.5	72.28
32	105	73.79	130	73.62	155	78.70	180	80.26
33	105.5	82.04	130.5	73.45	155.5	75.16	180.5	71.45
34	106	66.07	131	72.61	156	75.16	181	72.61
35	106.5	78.70	131.5	78.52	156.5	71.29	181.5	70.55
36	107	85.11	132	9236.34	157	78.25	182	73.03
37	107.5	67.14	132.5	73.62	157.5	79.80	182.5	80.91
38	108	80.26	133	70.31	158	81.38	183	70.55
39	108.5	63.31	133.5	77.27	158.5	78.70	183.5	71.12
40	109	4285.49	134	72.03	159	83.75	184	74.56
41	109.5	4310.23	134.5	77.89	159.5	77.45	184.5	67.14
42	110	75.77	135	69.18	160	74.22	185	73.20
43	110.5	82.51	135.5	70.55	160.5	72.44	185.5	82.51
44	111	75.60	136	73.79	161	67.69	186	70.15
45	111.5	77.27	136.5	70.15	161.5	78.25	186.5	74.22
46	112	76.38	137	79.34	162	74.56	187	74.82
47	112.5	80.54	137.5	72.28	162.5	72.44	187.5	73.62
48	113	74.56	138	87.30	163	69.58	188	72.61
49	113.5	79.80	138.5	76.82	163.5	72.61	188.5	6360.63
50	114	85.41	139	74.56	164	70.55	189	66.37

## FINE TUNE Pulses; Fundamental Frequency = 418MHz

	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m	mSec	Level uV/m
1	95	146.05	120	134.12	145	130.92	170	147.23
2	95.5	149.62	120.5	139.96	145.5	142.56	170.5	148.94
3	96	133.35	121	138.04	146	139.64	171	169.24
4	96.5	146.89	121.5	134.74	146.5	131.22	171.5	149.28
5	97	136.62	122	131.98	147	144.54	172	129.42
6	97.5	157.58	122.5	141.09	147.5	135.21	172.5	139.16
7	98	131.98	123	149.28	148	150.14	173	144.21
8	98.5	162.93	123.5	136.30	148.5	148.94	173.5	137.72
9	99	148.08	124	146.89	149	141.91	174	146.89
10	99.5	32136.61	124.5	140.77	149.5	157.58	174.5	140.77
11	100	32885.16	125	139.16	150	155.96	175	135.21
12	100.5	129.72	125.5	159.22	150.5	144.54	175.5	124.31
13	101	131.52	126	151.71	151	141.09	176	150.14
14	101.5	142.56	126.5	31117.16	151.5	137.40	176.5	135.52
15	102	172.78	127	143.38	152	141.09	177	152.93
16	102.5	133.35	127.5	124.74	152.5	142.56	177.5	166.92
17	103	134.74	128	149.28	153	28707.81	178	144.88
18	103.5	163.87	128.5	136.30	153.5	151.01	178.5	134.43
19	104	117.22	129	158.85	154	139.96	179	140.77
20	104.5	152.23	129.5	159.22	154.5	139.16	179.5	24917.24
21	105	134.74	130	124.02	155	141.09	180	25118.86
22	105.5	156.68	130.5	146.55	155.5	126.33	180.5	143.71
23	106	133.35	131	125.75	156	138.04	181	128.38
24	106.5	135.52	131.5	160.88	156.5	143.38	181.5	165.20
25	107	154.17	132	141.58	157	143.38	182	151.71
26	107.5	138.04	132.5	123.03	157.5	152.93	182.5	145.71
27	108	145.38	133	151.36	158	134.43	183	135.21
28	108.5	136.93	133.5	134.74	158.5	173.38	183.5	139.64
29	109	139.64	134	134.12	159	142.56	184	141.58
30	109.5	129.12	134.5	151.36	159.5	136.93	184.5	170.61
31	110	149.62	135	156.31	160	129.12	185	139.96
32	110.5	140.44	135.5	142.23	160.5	135.52	185.5	128.38
33	111	146.05	136	134.43	161	141.91	186	141.09
34	111.5	133.66	136.5	157.58	161.5	147.74	186.5	137.40
35	112	155.42	137	141.58	162	145.38	187	149.62
36	112.5	146.89	137.5	130.17	162.5	154.70	187.5	139.64
37	113	32433.96	138	145.71	163	141.91	188	155.42
38	113.5	31878.66	138.5	139.64	163.5	155.06	188.5	152.23
39	114	172.39	139	136.93	164	139.16	189	141.91
40	114.5	135.83	139.5	29648.31	164.5	147.23	189.5	134.12
41	115	139.16	140	29888.22	165	150.49	190	143.38
42	115.5	133.35	140.5	130.92	165.5	125.75	190.5	157.94
43	116	143.05	141	139.64	166	151.71	191	143.38
44	116.5	161.25	141.5	139.64	166.5	26515.51	191.5	143.71
45	117	151.36	142	150.14	167	136.93	192	153.46
46	117.5	145.38	142.5	151.01	167.5	130.92	192.5	143.05
47	118	140.77	143	153.46	168	136.62	193	24266.10
48	118.5	156.68	143.5	130.17	168.5	146.05	193.5	137.72
49	119	143.38	144	150.49	169	139.64	194	196.34
50	119.5	130.17	144.5	150.14	169.5	153.82	194.5	141.58