

FIELD STRENGTH CALCULATIONS (FCC)

DESCRIPTION: Class B Digital Device - FCC Limits

ITEM TESTED: [Wireless Intercoms - Receiver Emissions, FRS Radios](#)
MANUFACTURER: [Linear Corp.](#)
TRADE NAME:
FCC ID: [EF4 RFI00001](#)

DATE: [05/24/2001](#)

REFERENCE DOCUMENT: SECTION 15.109
(a)

1 uV/M at 3 meters = 0 dBuV = -107 dBm (reference level).
Field Strength in dBm = dBuV - 107 dBm.
Field Strength in dBuV = dBm + 107 dBm.

Please refer to tables for Antenna Factors not already listed
Preamp gain (.1 to 1300 MHz) = 26dB and (1300-2000 MHz) =21 dB.

For 1 meter to 3 meter conversion use
9.54dB.

Since dBuV = 20 Log (uV/M), uV/M = Antilog (dBuV/20).

DISTANCE AT WHICH MEASURED: 3 Meters, 0.8 Meter
above ground

Strength (dBuV) = meter reading (dBm) + Antenna and Loss
factor - Preamp gain (26 or 21dB) - 1 meter to 3 meter
(9.54dB) if needed + 107 dBm.

TABLE 2

A	B		C	D	E		F	G	H	I	L		G	H	O	P
Tuned	Emission	Ant.	Ambient	FCC			Antenna	Cable	Amp	Dist						
Frequency	Frequency	Type	Level	Limit	Meter		Factor	Loss	Gain	Fac	Field	Strength		FCC	dB:FCC	FREQ.
MHz	MHz		dBm	dBm	Reading		dB	dB	dB	dB	dBm/mtr	dBuV/mtr	uV/mtr	uV/M	dB	MHz
	35.40	BI.CON.	-110.34	-47.66	-69.50		15.90	0.30	26.00	9.54	-88.84	18.16	8.09	100.00	-21.84	35.40
	44.13	BI.CON.	-112.84	-45.16	#N/A		13.30	0.40	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	44.13
	54.13	BI.CON.	-117.44	-40.56	#N/A		8.70	0.40	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	54.13
	64.13	BI.CON.	-117.54	-40.46	#N/A		8.50	0.50	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	64.13
	70.00	BI.CON.	-117.24	-40.76	#N/A		8.80	0.50	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	70.00
	80.00	BI.CON.	-117.74	-40.26	#N/A		8.30	0.50	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	80.00
	90.00	BI.CON.	-117.04	-40.96	#N/A		8.90	0.60	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	90.00
	100.00	BI.CON.	-115.84	-42.16	#N/A		10.10	0.60	26.00	9.54	#N/A	#N/A	#N/A	100.00	#N/A	100.00
	110.00	BI.CON.	-114.24	-40.24	#N/A		11.70	0.60	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	110.00
	120.00	BI.CON.	-112.24	-42.24	#N/A		13.60	0.70	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	120.00
	130.00	BI.CON.	-111.44	-43.04	#N/A		14.40	0.70	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	130.00
	140.00	BI.CON.	-111.34	-43.14	#N/A		14.40	0.80	26.00	9.54	#N/A	#N/A	#N/A	150.00	#N/A	140.00

NOTE: Minor clocks every 1 MHz up to 64 MHz at zero distance. Not visible at 1 Mtr.

Actual frequency range of testing is from 30 to 2.0 GHz.

'05/24/2001

John W. Kuirinen

TESTED
BY

DATE

FILE
NAME: RFI001_1_RX

DISK NAME: FCC DATA

TABLE 2

FIELD STRENGTH CALCULATIONS (FCC)

DESCRIPTION:Receivers 467 MHz

ITEM TESTED:Wireless Intercom - Receiver Emission

MANUFACTURER:LINEAR CORP.

TRADE NAME:

FCC ID:EF4 RFI00001

DATE:05/24/2001

REFERENCE DOCUMENT: SECTION 15.109(a)

1 uV/M at 3 meters = 0 dBuV = -107 dBm (reference level).
Field Strength in dBm = dBuV - 107 dBm.
Field Strength in dBuV = dBm + 107 dBm.

Please refer to tables for Antenna Factors not already listed
Preamp gain (.1 to 1300 MHz) = 26dB and (1300-2000 MHz) =21 dB.

For 1 meter to 3 meter conversion use 9.54dB.

Since dBuV = 20 Log (uV/M), uV/M = Antilog (dBuV/20).

Calculation from measurement data:
Field Strength (dBuV) = meter reading (dBm) + Antenna and Loss
factor - Preamp gain (26 or 21dB) - 1 meter to 3 meter
factor (9.54dB) if needed + 107 dBm.

TABLE 3

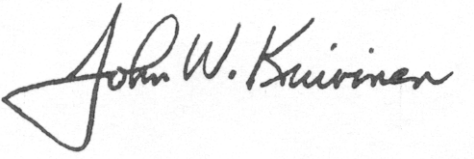
DISTANCE AT WHICH MEASURED: 3 Meters, 0.8 Meter above ground

A	B	C	D	E	F	G	H	I	K	L	G	H	O	P
Tuned	Emission	Ambient	FCC Limit	Meter	Antenna	Cable	Amp Gain	Dist Fac	Field Strength			FCC	dB:FC C	FREQ.
Frequency MHz	Frequency MHz	Level dBm	dBm	Reading dBm	Factor dB	Loss dB	dB	dB	dBm/mtr	dBuV/mtr	uV/mtr	Limit uV/M	dB	MHz
467.69	417.69	-103.84	-48.14	#N/A	22.5	1.4	27.2	9.54	#N/A	#N/A	#N/A	200.00	#N/A	417.69
	835.38	-96.54	-55.44	#N/A	28.4	2.1	26.5	9.54	#N/A	#N/A	#N/A	200.00	#N/A	835.38
	1253.06	-92.24	-51.78	#N/A	26.7	2.6	21.0	9.54	#N/A	#N/A	#N/A	500.00	#N/A	1253.06
	1670.75	-89.04	-54.98	#N/A	28.9	3.1	20.5	9.54	#N/A	#N/A	#N/A	500.00	#N/A	1670.75
	2088.44	-85.84	-58.18	#N/A	30.7	3.5	19.5	9.54	#N/A	#N/A	#N/A	500.00	#N/A	2088.44
	2506.13	-78.64	-65.38	#N/A	31.8	3.9	13.8	9.54	#N/A	#N/A	#N/A	500.00	#N/A	2506.13

The spectrum was searched from 25 to 2000 MHz per 15.33(b)
No other emissions were observed except those shown on this page.

NOTE: No significant emissions found at 3 meters or 1 meter. Weak local oscillator emissions found at zero distance up to 1253 MHz

05/24/2001



TESTED
BY
FILE
NAME:

FCC_RX

DATE

DISK:

TABLE 3

FIELD STRENGTH CALCULATIONS (FCC)

DESCRIPTION: Transmitter 467 MHz

ITEM TESTED: Wireless Intercom - Transmitter Radiated Emission

MANUFACTURER: LINEAR CORP.

TRADE NAME:

FCC ID: EF4 RFI00001

DATE: 05/24/2001

REFERENCE DOCUMENT: SECTION 95.635 Unwanted Radiation

1 uV/M at 3 meters = 0 dBuV = -107 dBm (reference level).

Field Strength in dBm = dBuV - 107 dBm.

Field Strength in dBuV = dBm + 107 dBm.

Please refer to tables for Antenna Factors not already listed

Preamp gain (.1 to 1300 MHz) = 26dB and (1300-2000 MHz) =21 dB.

For 1 meter to 3 meter conversion use 9.54dB.

Since dBuV = 20 Log (uV/M), uV/M = Antilog (dBuV/20).

Calculation from measurement data:

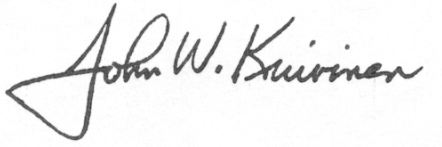
Field Strength (dBuV) = meter reading (dBm) + Antenna and Loss factor - Preamp gain (26 or 21dB) - 1 meter to 3 meter factor (9.54dB) if needed + 107 dBm.

DISTANCE AT WHICH MEASURED: 3 Meters, 0.8 Meter above ground

TABLE 4

A	B	C	D	E	F	G	H	I	K	L	G	H	O	P
Tuned	Emission	Ambient	FCC Limit	Meter	Antenna	Cable	Amp Gain	Dist Fac	Field Strength			FCC	dB:FCC	FREQ.
Frequency MHz	Frequency MHz	Level dBm	dBm	Reading dBm	Factor dB	Loss dB	dB	dB	dBm/mtr	dBuV/mtr	uV/mtr	Limit uV/M	dBc	MHz
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
467.6875	467.6875	-75.64	2.00	2.00	23.4	1.5	0.0	9.54	17.36	124.36	1651961.80	1652000.00	0.00	467.69
	935.3750	-68.94	-4.70	-58.10	29.3	2.3	0.0	9.54	-36.04	70.96	3531.83	1652000.00	-53.40	935.38
	1403.0625	-70.14	-3.50	-45.30	27.6	2.8	0.0	9.54	-24.44	82.56	13427.65	1652000.00	-41.80	1403.06
	1870.7500	-67.44	-6.20	-55.60	29.8	3.3	0.0	9.54	-32.04	74.96	5597.58	1652000.00	-49.40	1870.75
	2338.4375	-65.34	-8.30	-58.00	31.4	3.8	0.0	9.54	-32.34	74.66	5407.54	1652000.00	-49.70	2338.44
	2806.1250	-63.84	-9.80	-67.50	32.5	4.2	0.0	9.54	-40.34	66.66	2152.78	1652000.00	-57.70	2806.13
	3273.8125	-62.54	-11.10	-71.00	33.5	4.5	0.0	9.54	-42.54	64.46	1671.09	1652000.00	-59.90	3273.81
	3741.5000	-61.24	-12.40	#N/A	34.5	4.8	0.0	9.54	#N/A	#N/A	#N/A	1652000.00	#N/A	3741.50
	4209.1875	-60.24	-13.40	#N/A	35.3	5.0	0.0	9.54	#N/A	#N/A	#N/A	1652000.00	#N/A	4209.19
	4676.8750	-59.34	-14.30	-67.00	36.0	5.2	0.0	9.54	-35.34	71.66	3828.25	1652000.00	-52.70	4676.88
	5144.5625	-58.44	-15.20	#N/A	36.5	5.6	0.0	9.54	#N/A	#N/A	#N/A	1652000.00	#N/A	5144.56

The spectrum was searched from 25 to 2000 MHz per 15.33(b)
No other emissions were observed except those shown on this page.



05/24/2001

TESTED BY

DATE

FILE NAME:

fcc_467_tx.XLS

DISK NAME:

FCC DATA

TABLE 4

CONDUCTED EMISSION DATA SHEET
FOR FCC, PART 95.631

DESCRIPTION:FRS Radio Desktop Transmitter
Emission Data

ITEM TESTED:Sample No. 1

MANUFACTURER:LINEAR CORP.

TRADE NAME:N/A

FCC ID:EF4 RFI00001

DATE:05/21/2001

REFERENCE DOCUMENT:C63.4-1992 Test Procedure

A	B	C	D	E	F	G	H	I
Frequency MHz	Level dBm 50 ohm load	Atten. dB	Cable Loss dB	Level dBm	Corrected Level dBc	FCC Required Levels dBc	dB:FCC Limit	
465.6875	11.1	7.8	0.0	18.9	0.0	0.00	0	
931.375	-26.0	7.8	0.0	-18.2	-37.1	-40.00	2.9	**
1397.063	-26.0	7.8	0.0	-18.2	-37.1	-40.00	2.9	**
1862.750	-38.3	7.8	0.0	-30.5	-49.4	-40.00	-9.4	
2328.438	-107.0	7.8	0.0	-99.2	-118.1	-40.00	-78.1	
2794.125	-107.0	7.8	0.0	-99.2	-118.1	-40.00	-78.1	
3259.813	-107.0	7.8	0.0	-99.2	-118.1	-40.00	-78.1	
3725.500	-61.2	7.8	0.0	-53.4	-72.3	-40.00	-32.3	
4191.188	-107.0	7.8	0.0	-99.2	-118.1	-40.00	-78.1	
4656.875	-107.0	7.8	0.0	-99.2	-118.1	-40.00	-78.1	

** The integral antenna forms a part of the output tuning network. This measurement is based on a 50 ohm non-reactive load and is not representative of the actual harmonic content when transmitting.

Levels at the noise floor are reported as -107 dBm.

TESTED BY

DATE

FILE NAME:RFI001_1.XLS

DISK NAME:FCC DATA

TABLE 5 - A

CONDUCTED EMISSION DATA SHEET
FOR FCC, PART 95.631

DESCRIPTION:FRS Radio Desktop Transmitter
Emission Data

ITEM TESTED:Sample No. 1
MANUFACTURER:LINEAR CORP.
TRADE NAME:N/A
FCC ID:EF4 RFI00001

DATE:05/21/2001

REFERENCE DOCUMENT:C63.4-1992 Test Procedure

A	B	C	D	E	F	G	H	I
Frequency	Level	Atten.	Cable	Level	Correc ted Level	FCC	dB:FCC	
MHz	dBm	dB	Loss	dBm	Level	Require d Levels	Limit	
	50 ohm load		dB		dBc	dBc		
		-	-					
467.5625	10.7	7.8	0.0	18.5	0.0	0.00	0	
935.1250	-28.5	7.8	0.0	-20.7	-39.2	-40.00	0.8	**
1402.6875	-29.0	7.8	0.0	-21.2	-39.7	-40.00	0.3	**
1870.2500	-40.0	7.8	0.0	-32.2	-50.7	-40.00	-10.7	
2337.8125	-107.0	7.8	0.0	-99.2	-117.7	-40.00	-77.7	
2805.3750	-107.0	7.8	0.0	-99.2	-117.7	-40.00	-77.7	
3272.9375	-107.0	7.8	0.0	-99.2	-117.7	-40.00	-77.7	
3740.5000	-61.2	7.8	0.0	-53.4	-71.9	-40.00	-31.9	
4208.0625	-107.0	7.8	0.0	-99.2	-117.7	-40.00	-77.7	
4675.6250	-107.0	7.8	0.0	-99.2	-117.7	-40.00	-77.7	

** The integral antenna forms a part of the output tuning network. This measurement is based on a 50 ohm non-reactive load and is not representative of the actual harmonic content when transmitting.

Levels at the noise floor are reported as -107 dBm.

TESTED BYDATE

FILE NAME:RFI001_2.XLS

DISK NAME:FCC DATA

TABLE 5 - B

15.107(a,c) COMPLIANCE MEASUREMENTS

Measurement procedure in accordance with C63.4-1992.

Conducted Measurements: 450 KHz to 30 MHz

Operating Frequency: 467.6875 or 467.5625 MHz

Instrumentation: Spectrum Analyzer: HP8562A
 Powerline Filter: Corcom 10ER3
 10Amp 120/250 VAC 50/60 Hz.
 Power Mains Network (LISN):
 Solar 8012-50-R-24-BNC

The RFI00001 transceiver is powered from an external UL Listed Class 2 - 9 VDC regulated power supply.

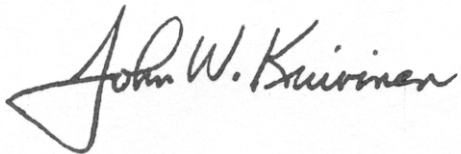
When receiving the transceiver operates on +9 VDC at an average current drain of less than 50 mA. The conducted emissions from this transmitter were very low and no significant change in conducted emissions in the range of 450 KHz to 30 MHz were observed.

When transmitting the transceiver operates on +9 VDC at an average current drain of less than 110 mA. The conducted emissions from this transmitter were very low and no significant change in conducted emissions in the range of 450 KHz to 30 MHz were observed.

A short BNC to BNC cable connected the LISN output port to the spectrum analyzer.

In accord with Section 2.948 of the Commission's Rules, a Test Site submittal is on file with the commission and a Letter of Acceptance dated March 23, 2001 (File 90767) is a portion of the Commission's records.

The tests were performed at Linear Corporation, 2055 Corte Del Nogal, Carlsbad, CA. 92009.



John W. Kuivinen, P.E.

____ May 24, 2001 ____

Regulatory Compliance Engineer

Date

CONDUCTED EMISSION DATA SHEET FOR FCC, PART 15.107(a)									
DESCRIPTION:	RFI00001 Unit No. 1 Microcontroller Emission Data								
ITEM TESTED:	FRS Wireless Intercom								
MANUFACTURER:	LINEAR CORP.								
TRADE NAME:									
PRODUCT ID:	EF4 RFI00001								
DATE:	05/24/2001								
REFERENCE DOCUMENT:	C63.4-1992 Test Procedure								
Technical Notes:	1. The highest emission of the high or neutral input of the power line is the only emission recorded. 2. Peak reading on max hold is recorded using the HP8562A as specified in Instrumentation and Equipment list. A minimum of 10 sweeps is stored on the CRT before data is taken. 3. Line Impedance Stabilization Network (LISN) is a Solar 8012-50-R-24-BNC.								
A	B	C	D	E	F	G	H	I	
Frequency	Level	Level	Atten.	Cable	Emission	Emission	Spec.	dB:FCC	
MHz	dBm	dBuV	dB	Loss	Level	Level	Limit	Limit	
				dB	dBuV	uV	uV		
0.45	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
1.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
4.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
8.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
10.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
12.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
16.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
20.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
21.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
22.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
23.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
24.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
25.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
26.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
27.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
28.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
29.00	-107.0	0.0	0.0	0.0	0.0	1.00	250	-47.96	
NOTE: No significant emissions found in receive or transmit mode. All emissions were greater than 20 dB below the FCC limit.									

TABLE 6

John W. Kuivinen

