



Testing Tomorrow's Technology

**Radio Systems Corporation
FCC Part 15, Certification Application
Model FT-303A**

Original Issue Date: May 25, 2007

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MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: Radio Systems Corporation
MODEL: FT-303A
FCC ID: KE3-FT303A

ORIGINAL ISSUE DATE: May 25, 2007

This report concerns (check one): Original grant X
Class II change _____

Equipment type: **Low Power Transmitter**

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes _____ No X

If yes, defer until: _____
date

N.A. agrees to notify the Commission by N.A.
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

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SECTION 1
GENERAL INFORMATION

GENERAL INFORMATION

Product Description

The Equipment Under Test (EUT) is a Radio Systems Corporation 303.91 MHz Remote Transmitter Model FT-303A, which sends a transmitted signal when one of three buttons is pressed.

Related Submittal(s)/Grant(s)

The EUT will be used with DoC approved receivers.

SECTION 2
TESTS AND MEASUREMENTS

TESTS AND MEASUREMENTS

Configuration of Tested System

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

Since the EUT is a hand held device, it was rotated about all 3 axis in order to obtain worst case results.

Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and registered with the FCC, under designation number US5117. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

Modifications

- 1) No modifications were necessary to bring the EUT into compliance with the Part 15.231 limits

Test Equipment

Table 2 describes test equipment used to evaluate this product.

FIGURE 1
TEST CONFIGURATION

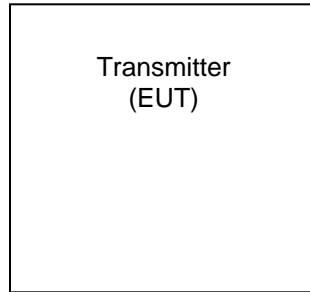


FIGURE 2a

Photographs for Spurious and Fundamental Emissions



FIGURE 2b

Photograph(s) for Spurious and Fundamental Emissions



TABLE 1

EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Remote Transmitter Radio Systems Corporation (EUT)	FT-303A	None	KE3-FT303A	None

TABLE 2
TEST INSTRUMENTS

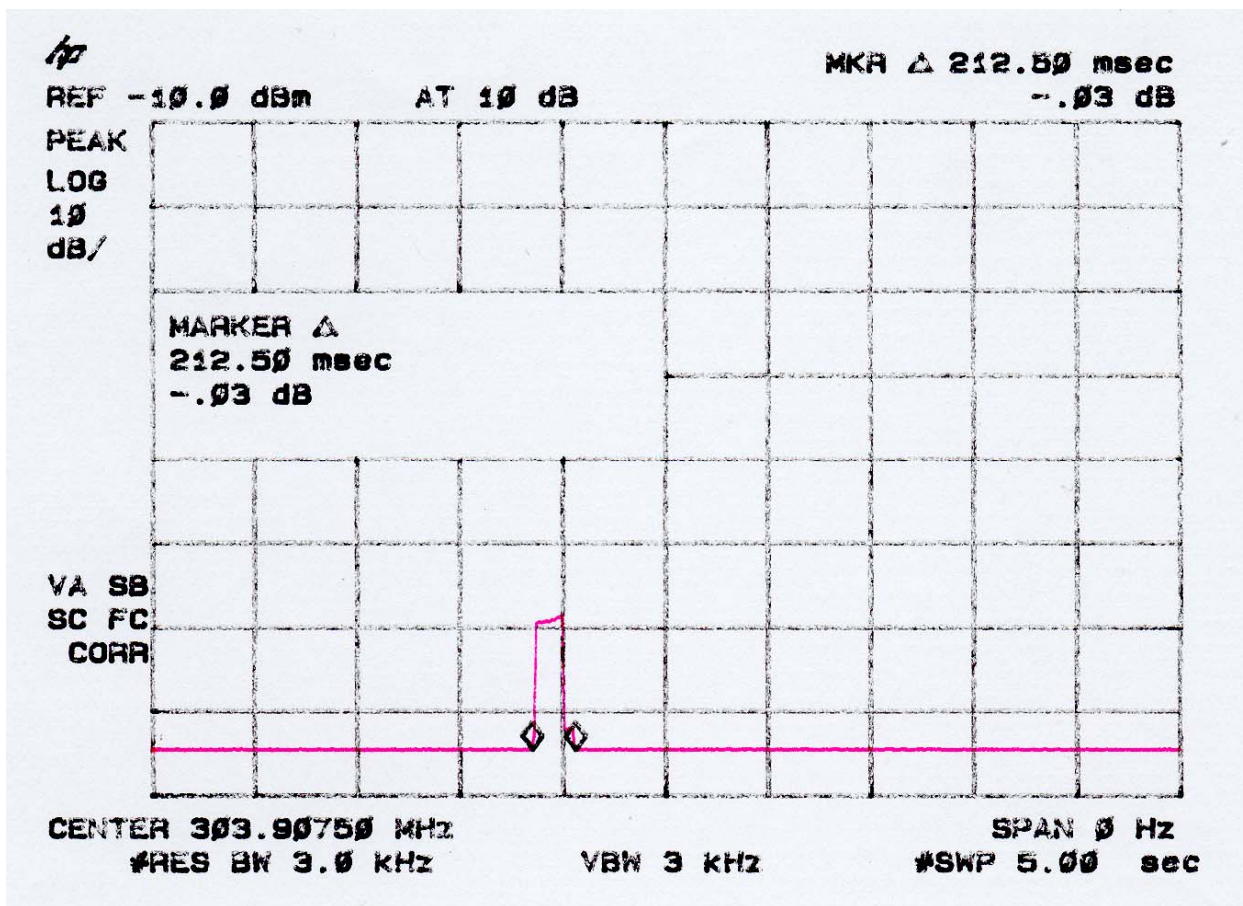
EQUIPMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	7/3/06
RF PREAMP	8447D	HEWLETT-PACKARD	2944A07436	5/24/06
RF PREAMP	8449B	HEWLETT-PACKARD	3008A00480	8/10/06
HORN ANTENNA	3115	A.H. Systems	9107-3723	10/16/06 2 Year
LOG PERIODIC ANTENNA	3136	EMCO	9110-3236	9/15/05 2 Year
CALCULATION PROGRAM	N/A	N/A	Ver. 6.0	N/A

Periodic Operation (47 CFR 15.231(a1))

A transmitter manually activated must automatically deactivate within not more than 5 seconds of being released. The transmitter is a 3 button transmitter. The EUT continues to transmit while each button is being pressed. The EUT ceases transmission within 300 msec upon being released as shown in Figure 3.

FIGURE 3

Periodic Operation 15.231(a)(c1)



Field Strength of Fundamental Emission (47 CFR 15.231b)

Measurements were made using a peak detector. Field strength of the peak fundamental emission is shown in Table 3a and Figure 4.

Duty Cycle Correction During 100 msec:

For detailed information regarding the duty cycle, please see Figures 5a through 5e. Plots 5a and 5b show transmit time of the 2 discrete pulse types used in the transmission. Plot 5d shows a single cycle of the pulse train. This cycle is repeated 4 times every 380.63 ms as shown in plot 5e.

Bit sequence contains 3 sync pulses (0.975 msec) and 7 pulse position encoded data bits (0.525 msec). The 7 data bits consists of 4 ID bits, 1 Function Bit, and 2 shock level bits.

Total TX = $4 * \{(3 * 0.975) + (7 * 0.525)\} = 26.4$ msec every 380.63 msec

The maximum allowed time to determine duty cycle correction is every 100 ms, and assuming that all pulse transmissions occur in the 100 ms time period, the duty cycle factor becomes:

$20 \log (26.4/100) = -11.6$ dB Correction Factor

Field strength of the average fundamental emission is shown in Table 3b.

TABLE 3a

FIELD STRENGTH OF FUNDAMENTAL EMISSION

Test Date: April 26, 2007
 UST Project: 07-0085
 Customer: Radio Systems Corporation
 Model: FT-303A

Peak Measurement

FREQ. (MHz)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	PEAK FCC LIMITS (uV/m) @ 3m
303.91	-41.8	18.2	14,779.5	55,791.8

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog $((-41.8 + 18.2 + 107)/20) = 14,779.5$
 CONVERSION FROM dBm TO dBuV = 107 dB

Tested
 By: 

Name: Louis A. Feudi

TABLE 3b

FIELD STRENGTH OF FUNDAMENTAL EMISSION

Test Date: April 26, 2007
UST Project: 07-0085
Customer: Radio Systems Corporation
Model: FT-303A

Average Measurement

FREQ. (MHz)	TEST DATA (dBm) @ 3m*	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	AVERAGE FCC LIMITS (uV/m) @ 3m
303.91	-53.4	18.2	3887.4	5,579.2

* Duty Cycle Correction = $20 \log (0.264) = -11.6 \text{ dB}$

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = $\text{Antilog} ((-53.4 + 18.2 + 107)/20) = 3887.4$

CONVERSION FROM dBm TO dBuV = 107 dB

Tested
By: *LAF*

Name: Louis A. Feudi

FIGURE 4

FIELD STRENGTH OF FUNDAMENTAL EMISSION 15.231(b)

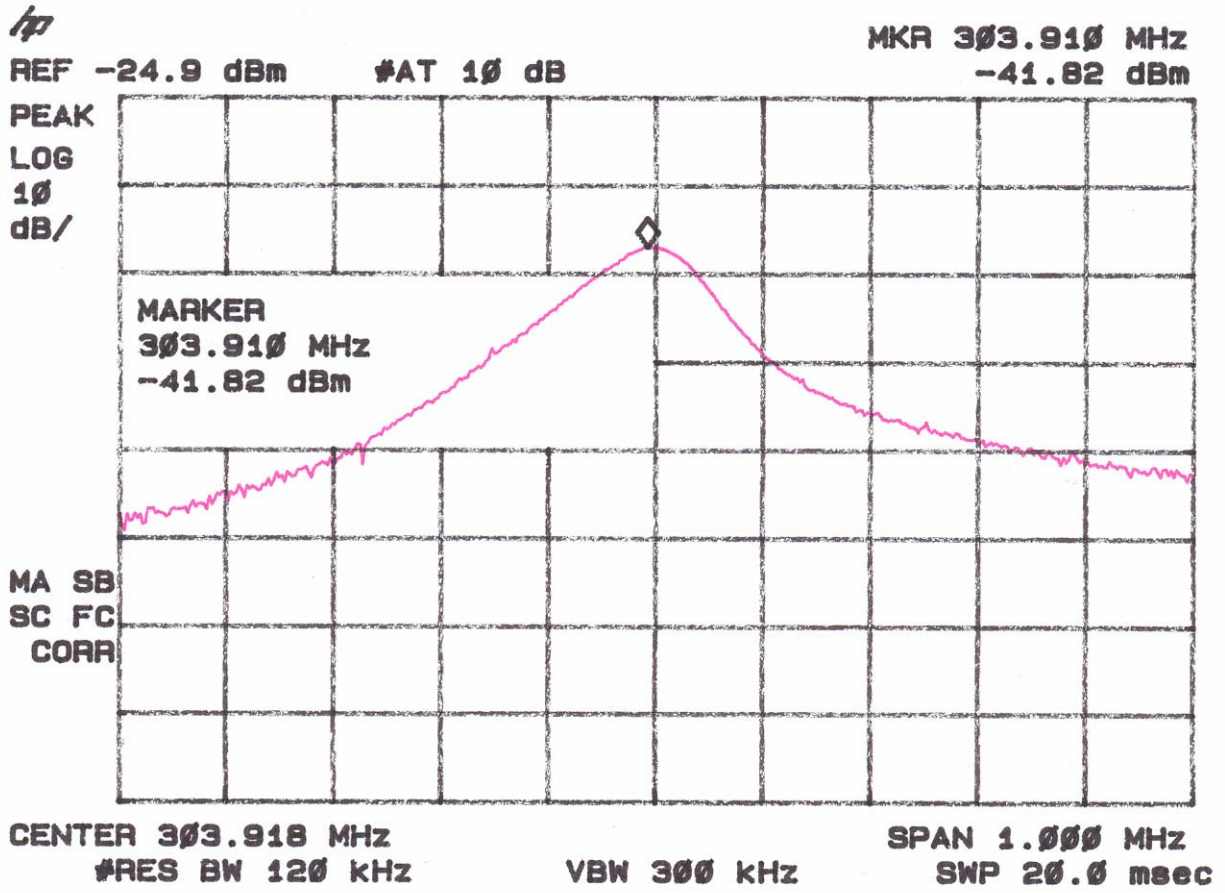


FIGURE 5a

DUTY CYCLE CHARACTERISTICS

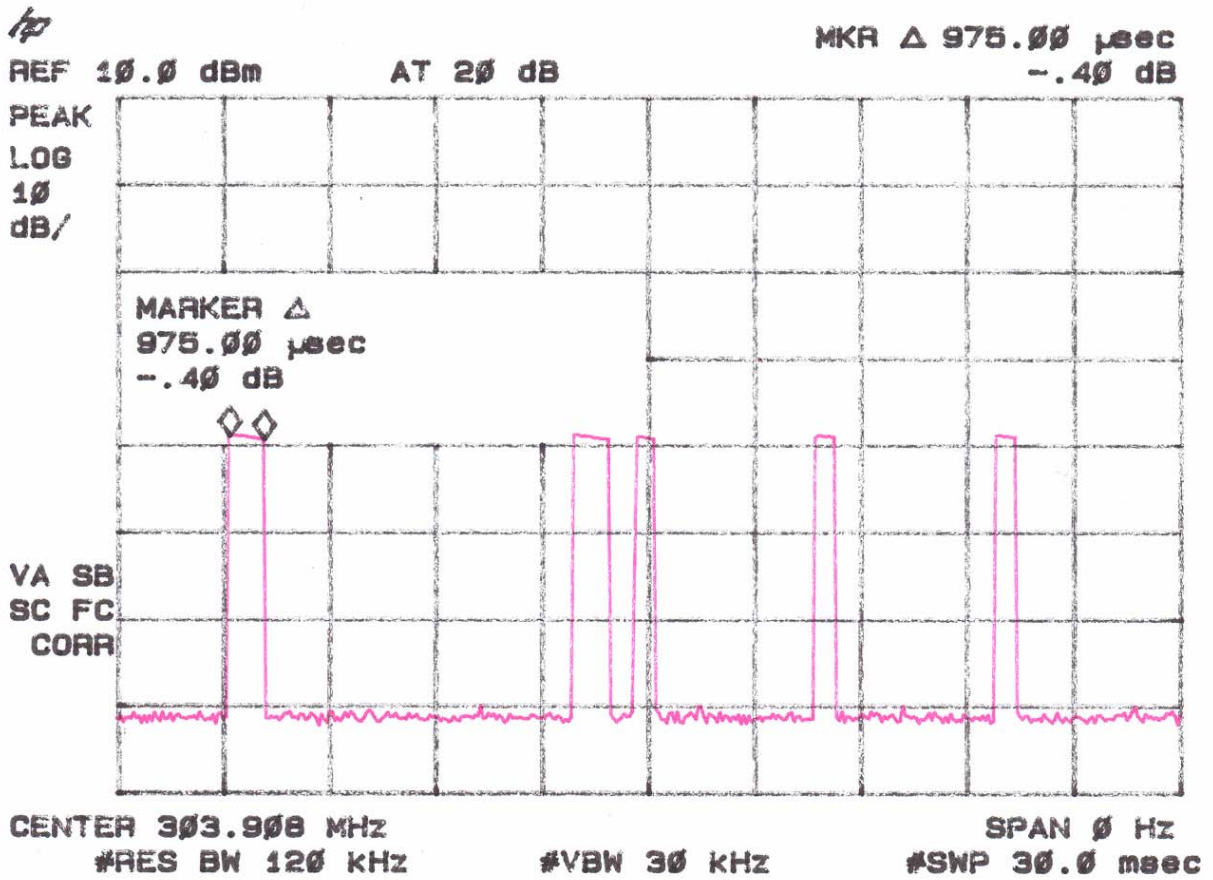


FIGURE 5b

DUTY CYCLE CHARACTERISTICS

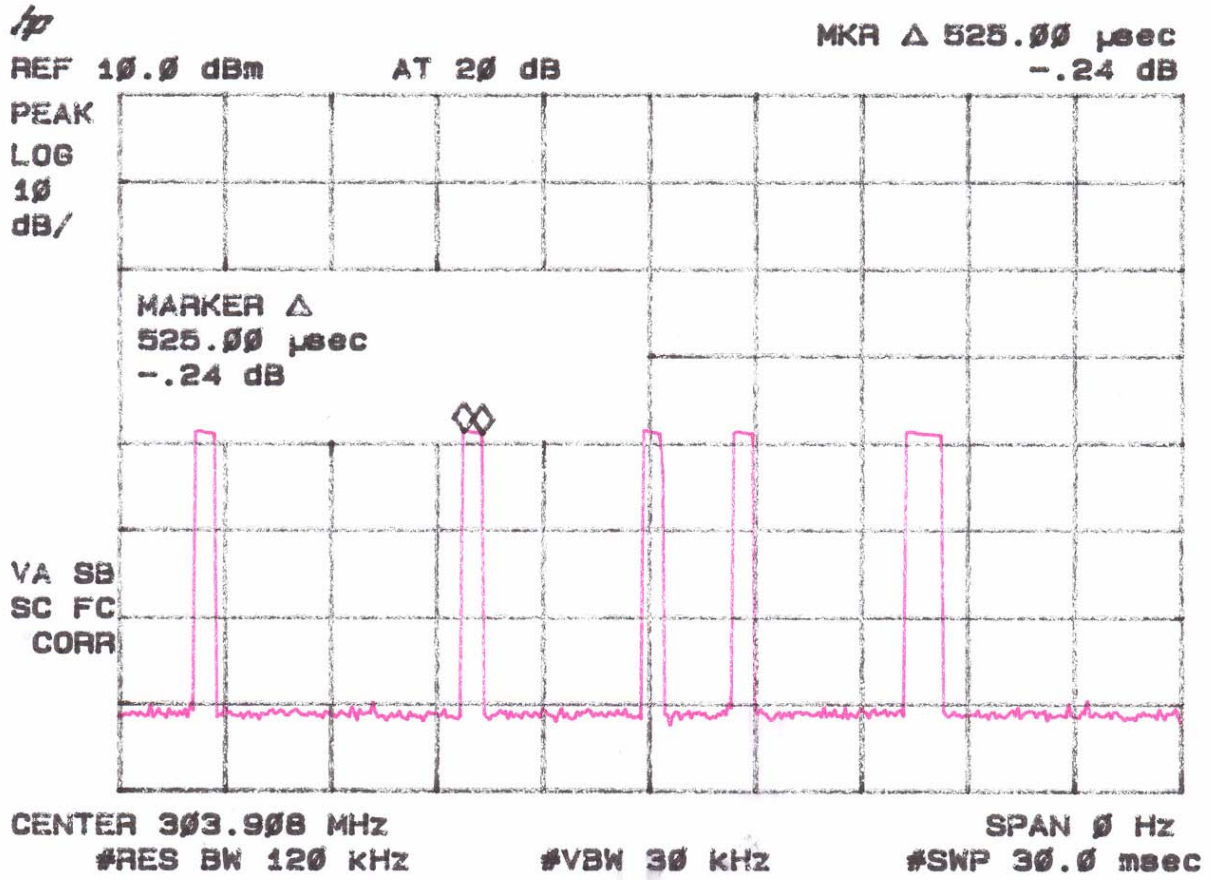


FIGURE 5c

DUTY CYCLE CHARACTERISTICS

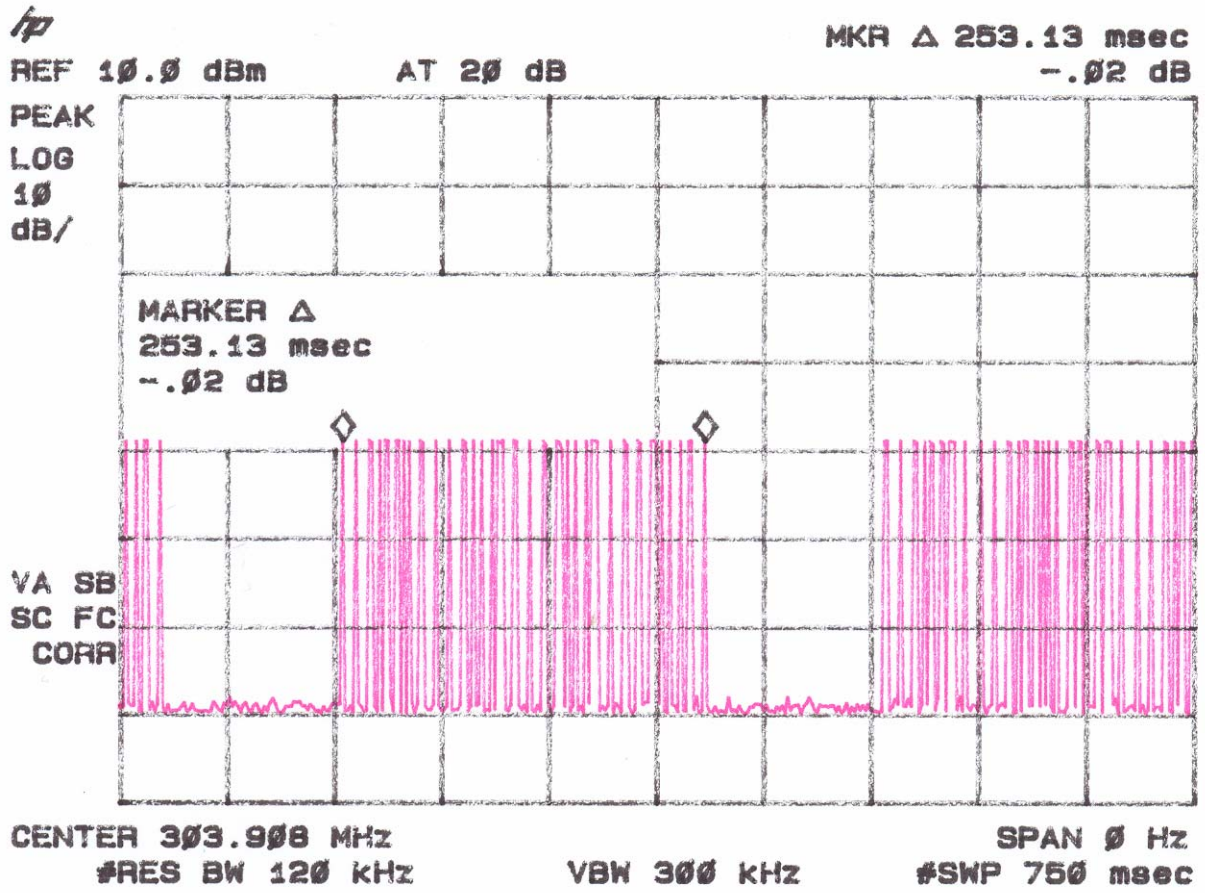


FIGURE 5d

DUTY CYCLE CHARACTERISTICS

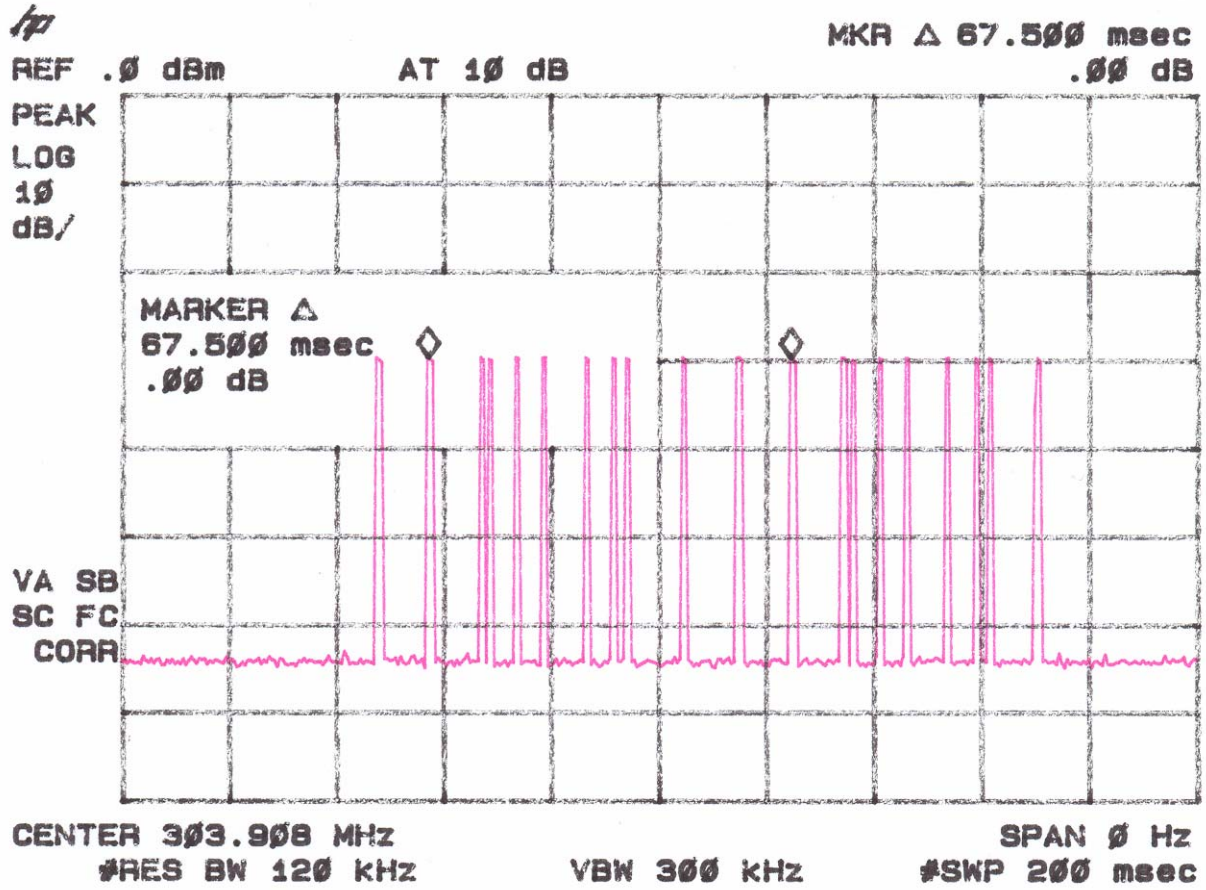
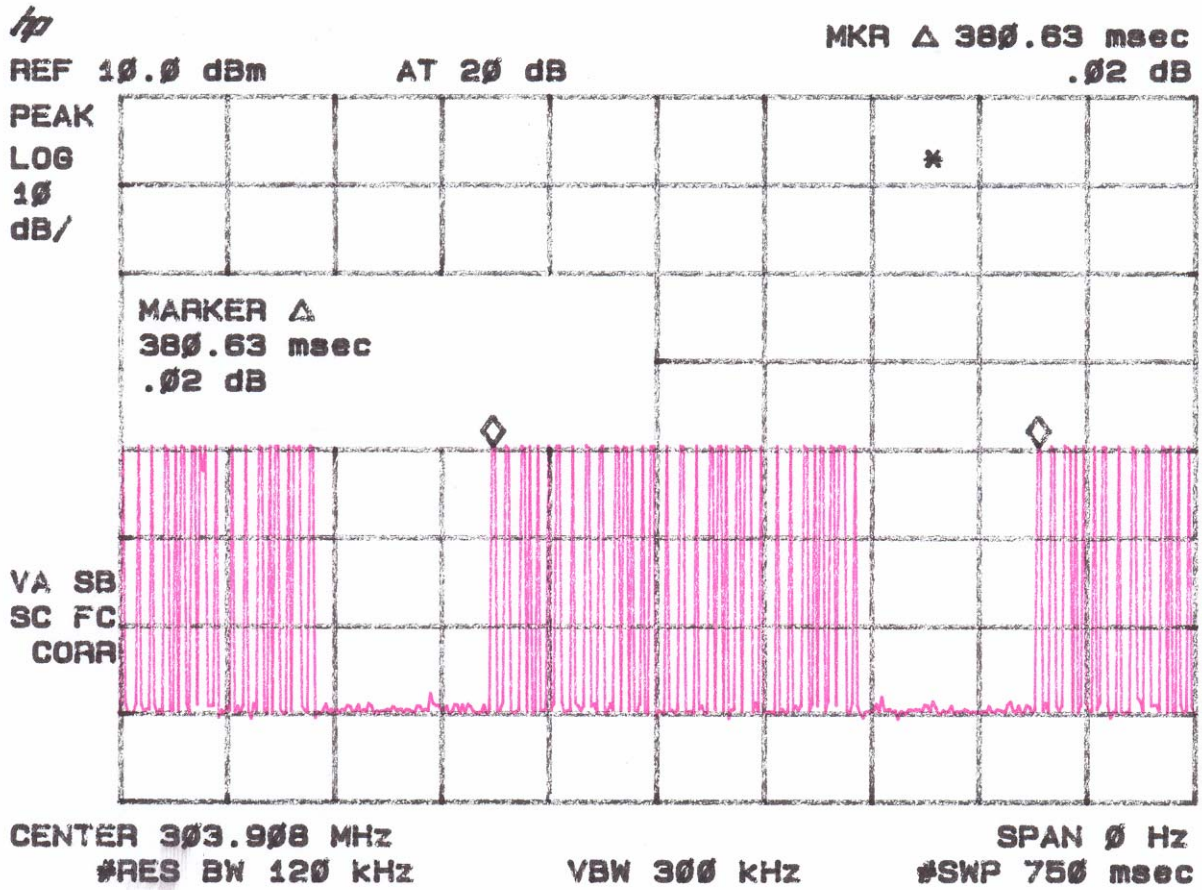


FIGURE 5e

DUTY CYCLE CHARACTERISTICS



Field Strength Of Spurious Emissions (47 CFR 15.231b)

Measurements were made using a peak detector. Field strength of Spurious Emissions are shown in Table 5 and Figures 6. For comparison to the average limits, duty cycle corrections were made as given in the previous section. Any emission less than 1000 MHz and falling within the restricted bands of 15.205 were not adjusted for averaging and the limits of 15.209 were applied.

TABLE 5a

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Date: April 26, 2007
 UST Project: 07-0085
 Customer: Radio Systems Corporation
 Model: FT-303A

Peak Measurement

Frequency MHz	Test Data (dBm)	AF Table	Test Data	AF+CA+AMP (dB)	Results (uV/m)	Limits (uV/m)	Distance/ Polarity	Margin (dB)	PK /QP
607.7788	-69.0	2LP3mH	38.0	23.7	1217.0	5579.2	3m./HORZ	13.2	PK
911.788	-95.8	2LP3mH	11.3	29.5	108.8	5579.2	3m./HORZ	34.2	PK
1215.626**	-59.7	1hn3mv	47.4	-7.3	100.0	5000.0	3m./VERT	34.0	PK
1519.499**	-55.6	1hn3mv	51.4	-6.6	173.6	5000.0	3m./VERT	29.2	PK
607.7788	-69.0	2LP3mH	38.0	23.7	1217.0	5579.2	3m./HORZ	13.2	PK

** Denotes restricted band of operation

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog ((-69.0 + 23.7 + 107)/20) = 1217.0
 CONVERSION FROM dBm TO dBuV = 107 dB

Tested By:  Name: Louis A. Feudi

TABLE 5b

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Date: April 26, 2007
 UST Project: 07-0085
 Customer: Radio Systems Corporation
 Model: FT-303A

Average Measurement

Frequency MHz	Test Data (dBm)	AF Table	Test Data	AF+CA+AMP (dB)	Results (uV/m)	Limits (uV/m)	Distance/ Polarity	Margin (dB)	PK/ Average
607.7788	-80.6	2LP3mH	26.4	23.7	320.1	557.9	3m./HORZ	4.8	AVG
911.788	-107.4	2LP3mH	-0.3	29.5	28.6	557.9	3m./HORZ	25.8	AVG
1215.626	-71.3	1hn3mv	35.8	-7.0	27.2	500.0	3m./VERT	25.3	AVG
1519.499	-67.2	1hn3mv	39.8	-6.3	47.4	500.0	3m./VERT	20.5	AVG
1823.443	-64.1	1hn3mv	42.9	-4.5	83.3	557.9	3m./VERT	16.5	AVG

* Duty Cycle Correction = $20 \log(0.264) = -11.6 \text{ dB}$

** Denotes restricted band of operation

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = $\text{Antilog}((-80.6 + 23.7 + 107)/20) = 320.1$
 CONVERSION FROM dBm TO dBuV = 107 dB

Tested By: *Louis A. Feudi*

Name: Louis A. Feudi

FIGURE 6a

SPURIOUS EMISSIONS 16.231(b)

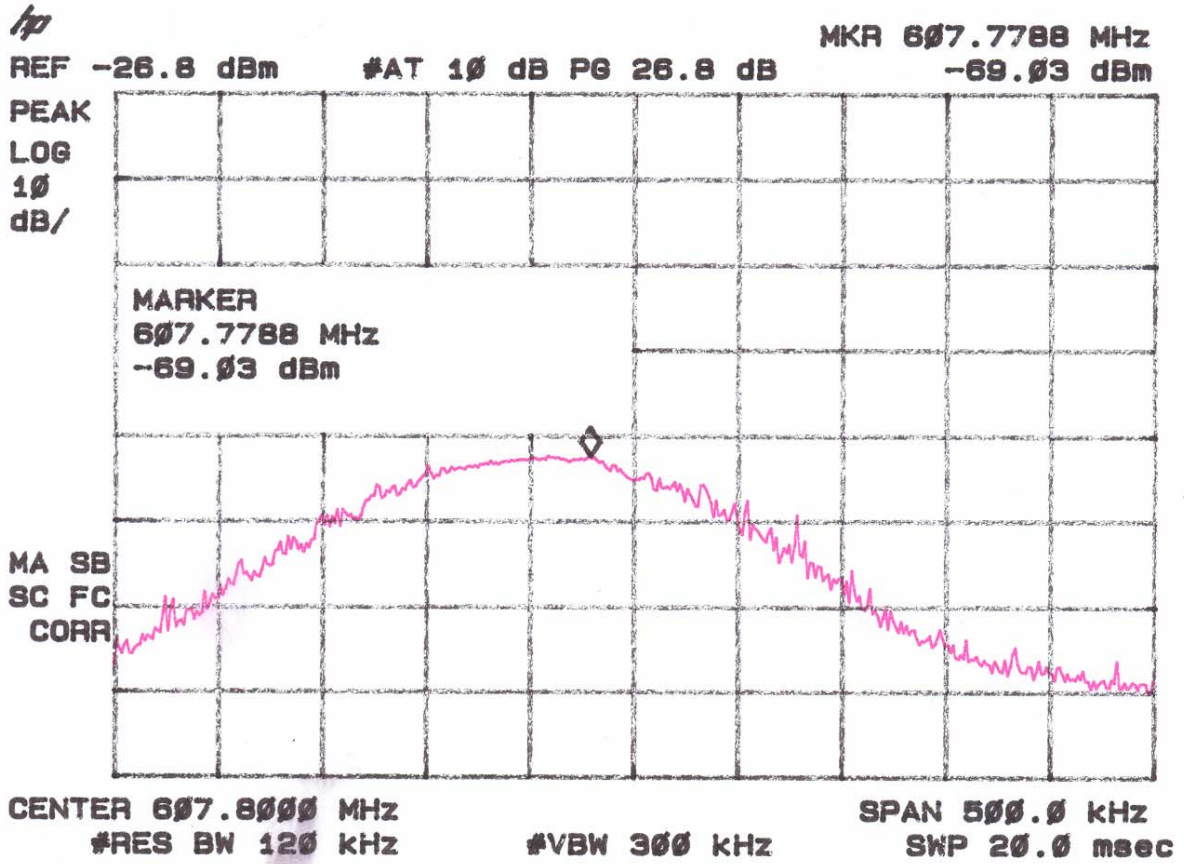


FIGURE 6b

SPURIOUS EMISSIONS 16.231(b)

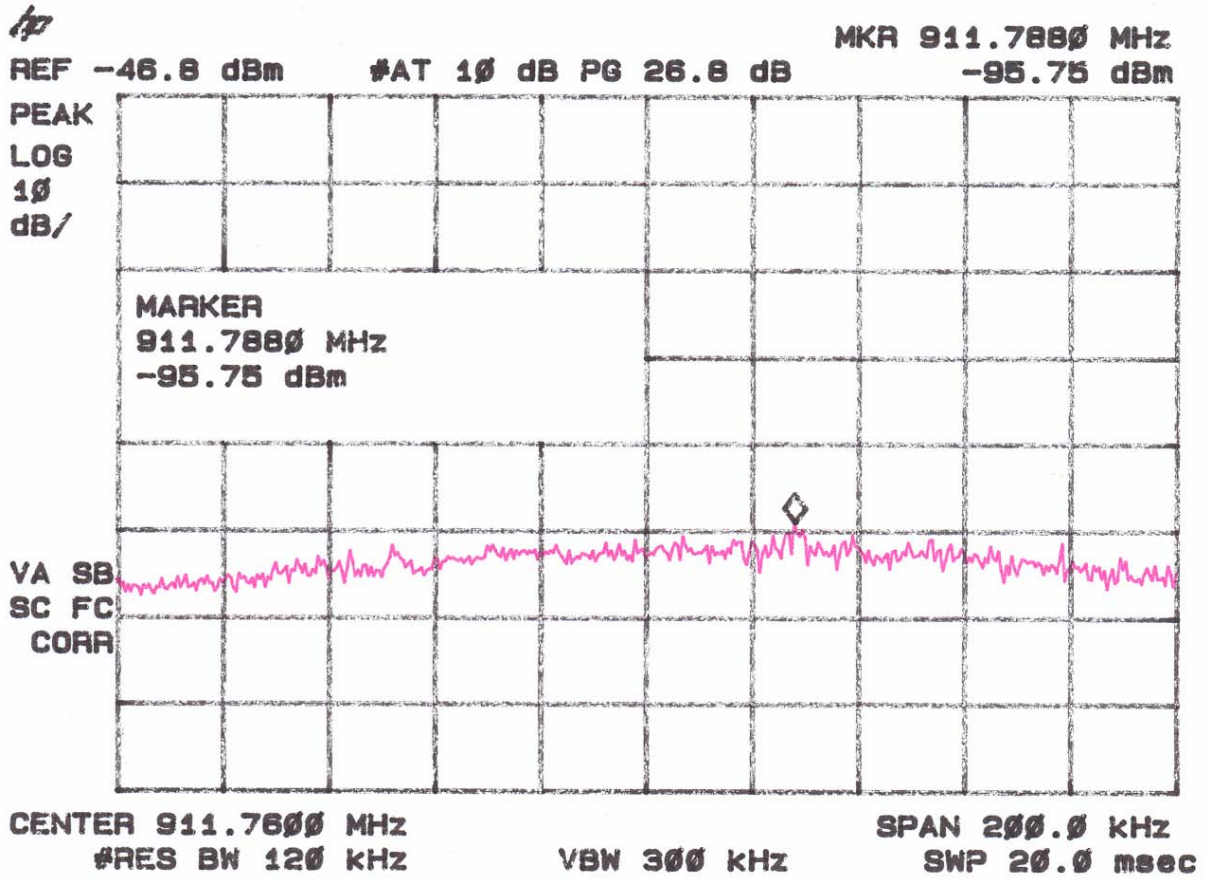


FIGURE 6c

SPURIOUS EMISSIONS 16.231(b)

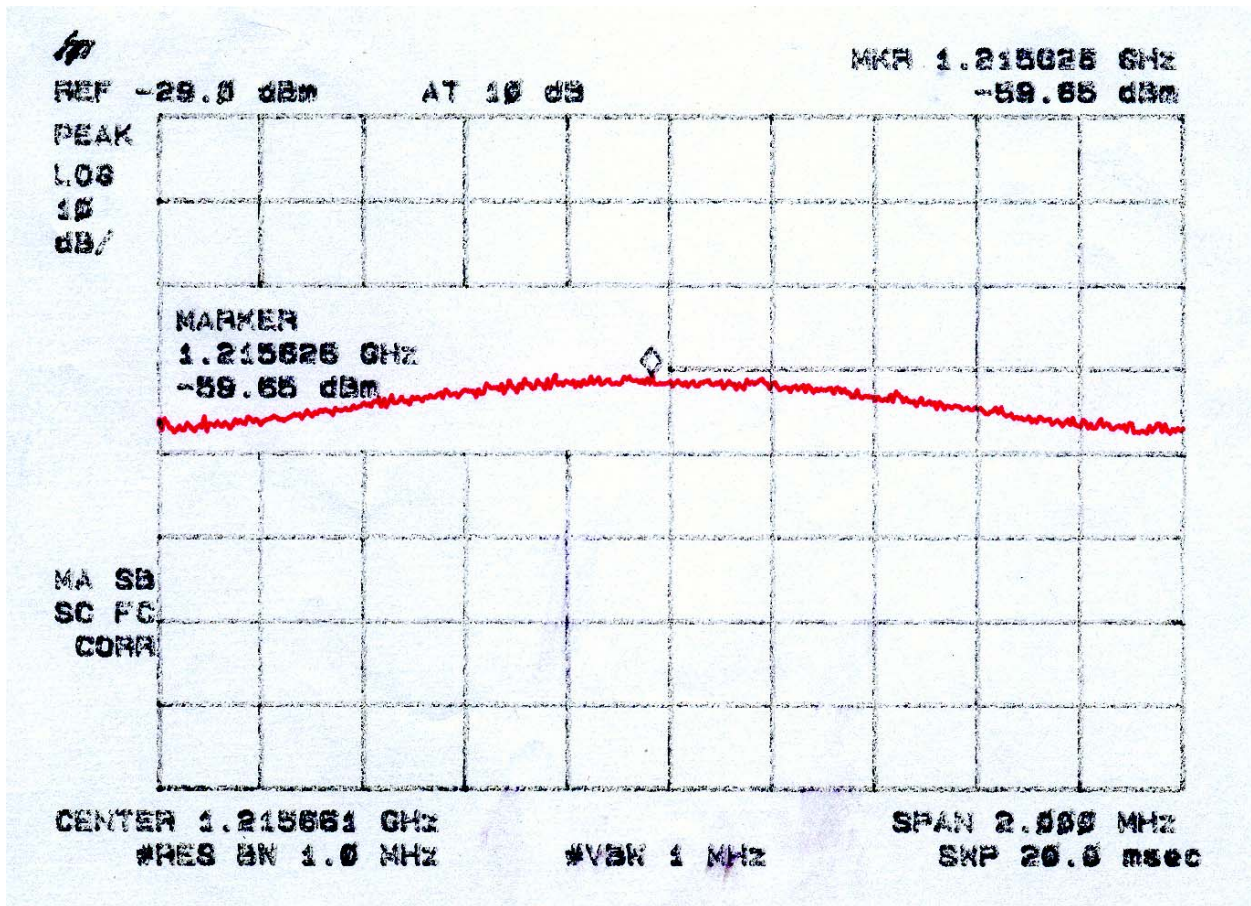


FIGURE 6d

SPURIOUS EMISSIONS 16.231(b)

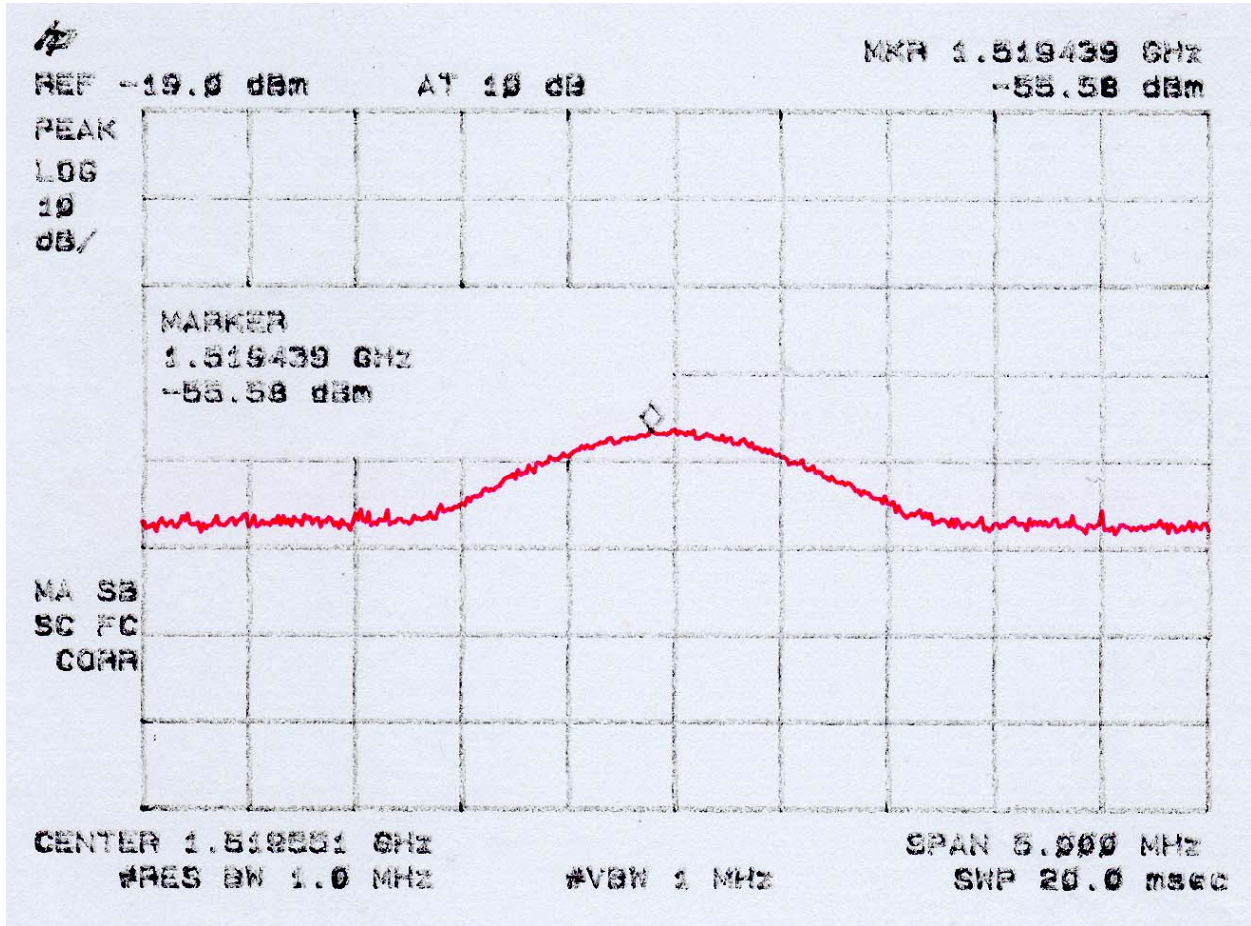
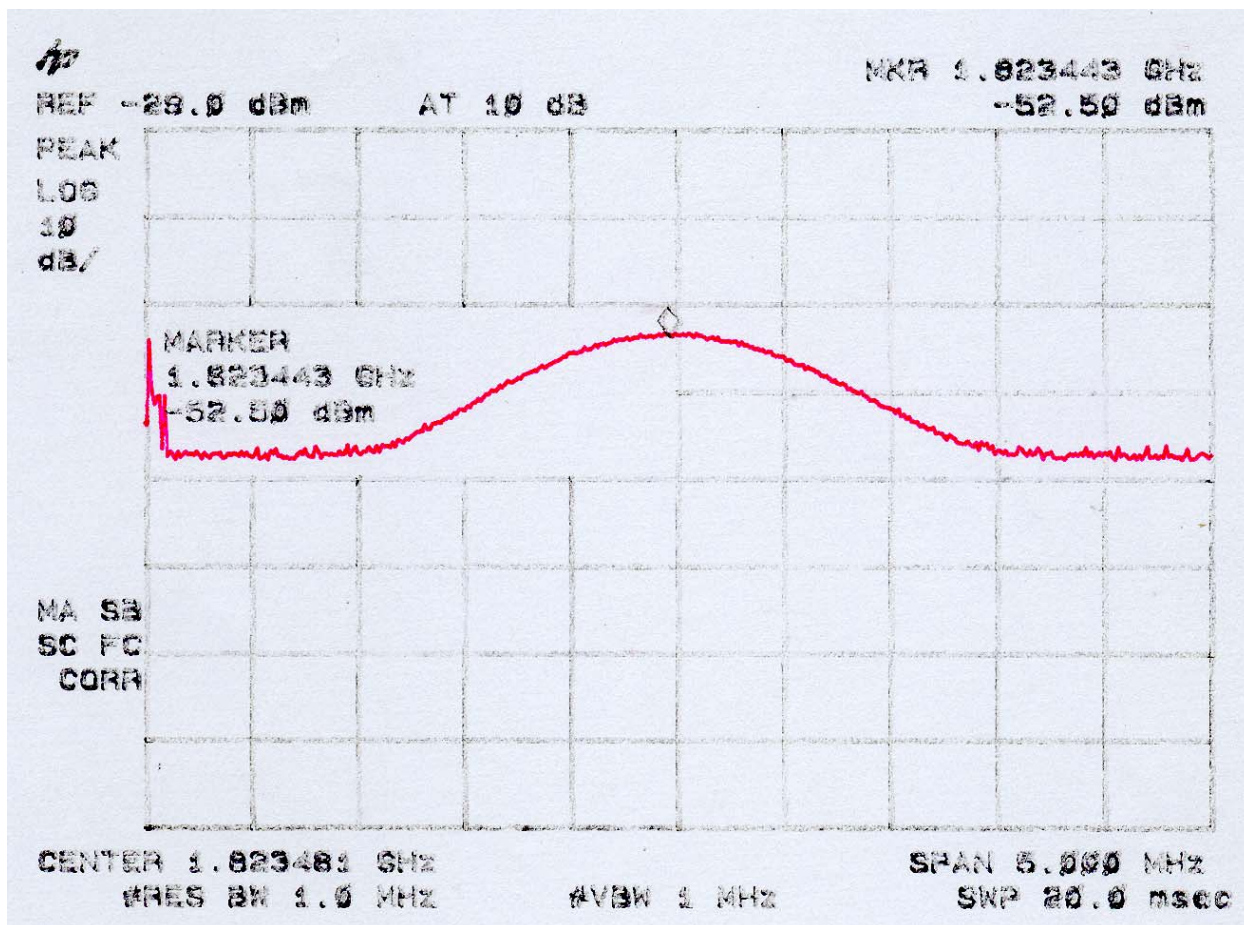


FIGURE 6e

SPURIOUS EMISSIONS 16.231(b)



20 dB Bandwidth of Fundamental Emission (47 CFR 15.231c)

The peak 20 dB bandwidth measurement of the fundamental emission is shown in Table 6 and Figure 7.

TABLE 6

20 dB BANDWIDTH OF FUNDAMENTAL EMISSION

Test Date: April 26, 2007
UST Project: 07-0085
Customer: Radio Systems Corporation
Model: FT-303A

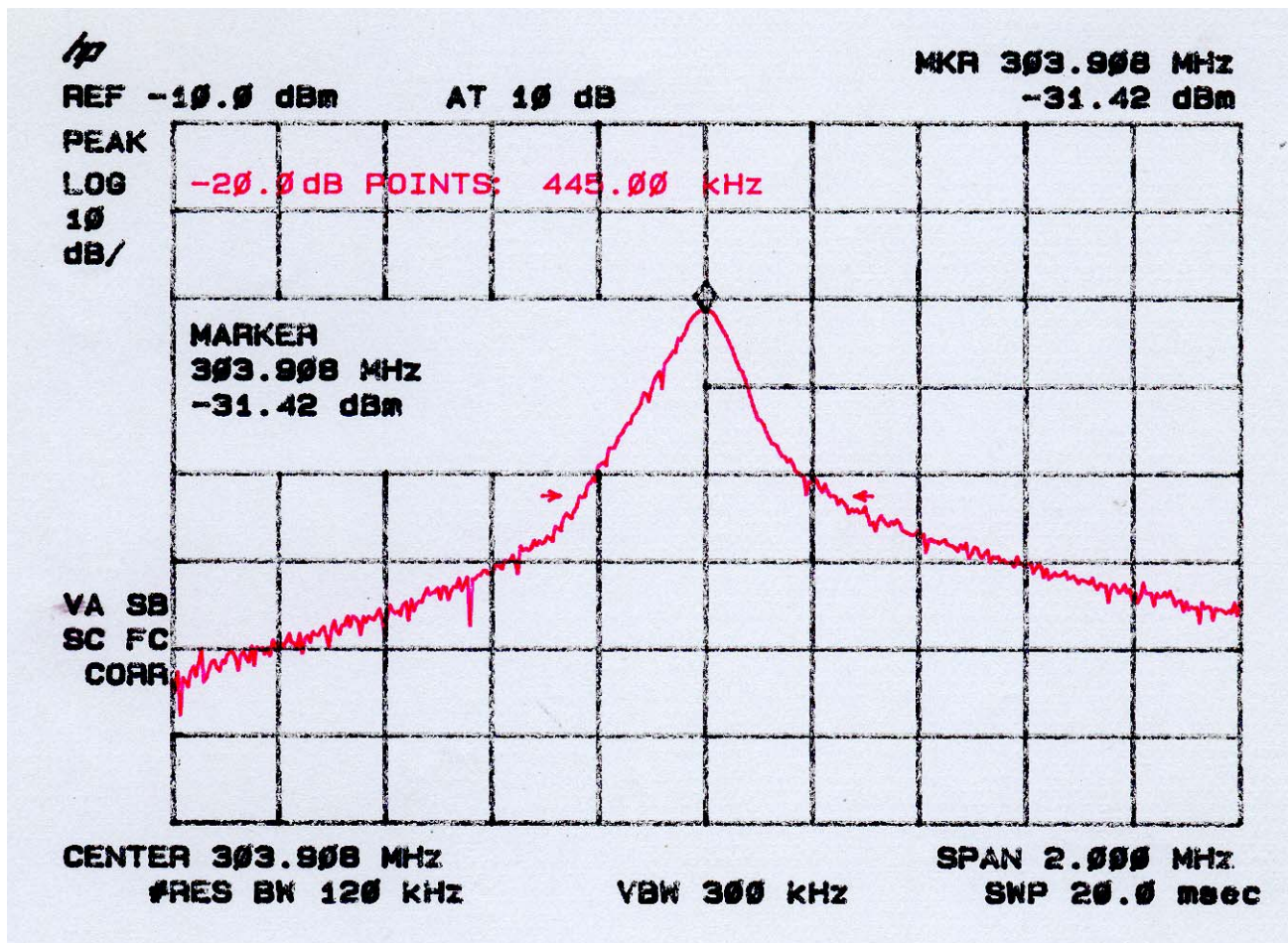
FREQUENCY (MHz)	20 dB BANDWIDTH (kHz)	FCC LIMITS (kHz)
303.908	445	759.6

FCC Limit = (0.25%) (Center Frequency) = (0.0025)(303.908 MHz) = 759.6 kHz

Tested
By: *LAF* **Name:** Louis A. Feudi

FIGURE 7

20 dB BANDWIDTH OF FUNDAMENTAL EMISSION 15.231(c)



Frequency Tolerance of Carrier Signal (47 CFR 15.231d)

The EUT does not operate in the 40.66 - 40.70 MHz band, therefore frequency tolerance measurements were deemed unnecessary.

Radiated Digital Device Emissions (47 CFR 15.109a)

Radiated emissions were evaluated from 30 to 1000 MHz. Measurements were made with the analyzer's bandwidth set to 120 kHz. Emissions are shown in Table 7.

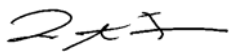
TABLE 7a

CLASS B
RADIATED EMISSIONS

Test Date: April 26, 2007
 UST Project: 07-0085
 Customer: Radio Systems Corporation
 Model: FT-303A

Radiated Emissions										
Test By:	Test:	FCC Final Verification				Client:	Radio Systems Corp.			
L.F.	Project:	07-0085	Class:	B	Model:	FT-303A Transmitter				
Frequency Range										
30 MHz - 1 GHz										
Frequency	Test Data	AF	Test Data	AF+CA-AMP	Results	Limits	Distance /	Margin	PK = n	
(MHz)	(dBm)	Table	(dBuV)	(dB)	(uV/m)	(uV/m)	Polarity	(dB)	/ QP	
No emissions seen within 20 dB of FCC limits										

SAMPLE CALCULATIONS: None

Tested By:  Name: Louis A. Feudi

Power Line Conducted Emissions (47 CFR 15.107a)

The EUT is operated by internal battery power or with optional power adapter / battery charger.

TABLE 8a

POWER LINE CONDUCTED EMISSIONS

Test Date: April 26, 2007
 UST Project: 07-0085
 Customer: Radio Systems Corporation
 Model: FT-303A

Peak Measurement Average Limits

Phase

Conducted Emissions									
Test By:	Test:	FCC Part 15 Certification				Client:	Radio Systems Corp.		
L.F.	Project:	07-0085		Class:	B	Model:	FT - 303A		
Frequency	Test Data	AF	Test Data	AF+CA-AMP	Results	Limits	Margin	PK = n	
(MHz)	(dBm)	Table	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	/ QP	
Not Applicable EUT Battery Powered									

Tested By: 

Name: Louis A. Feudi

TABLE 8b

POWER LINE CONDUCTED EMISSIONS

Test Date: April 26, 2007
 UST Project: 07-0085
 Customer: Radio Systems Corporation
 Model: FT-303A

Peak Measurement Average Limits
 Neutral

Conducted Emissions								
Test By:	Test: FCC Part 15 Certification				Client:	Radio Systems Corp.		
L.F.	Project:	07-0085		Class:	B	Model:	FT - 303A	
Frequency	Test Data	AF	Test Data	AF+CA-AMP	Results	Limits	Margin	PK = n
(MHz)	(dBm)	Table	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	/ QP
Not Applicable EUT Battery Powered								

Tested By:  Name: Louis A. Feudi