



**Radio Systems Corporation  
FCC Part 15, Certification Application  
Model PPT-105**

**December 11, 2002**

## MEASUREMENT/TECHNICAL REPORT

**COMPANY NAME:** Radio Systems Corporation

**MODEL:** PPT-105

**FCC ID:** KE3PPT105

**DATE:** December 11, 2002

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

Equipment type: **Low Power Transmitter**

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

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:

United States Technologies, Inc.  
3505 Francis Circle  
Alpharetta, GA 30004

Phone Number: (770) 740-0717  
Fax Number: (770) 740-1508

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SECTION 1  
GENERAL INFORMATION

## **GENERAL INFORMATION**

### **Product Description**

The Equipment Under Test (EUT) is a Radio Systems Corporation 303.825 MHz Remote Transmitter, which sends a transmitted signal when one of two 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 (1992). 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 worse 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 submitted to the FCC, and accepted in their letter marked 31040/SIT. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

### Modifications

To bring the EUT into compliance with the Part 15.231 limits, the manufacturer made the following changes:

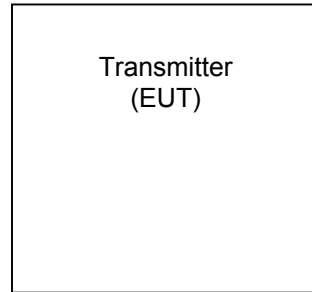
- 1) R8 was changed to 220k Ohm.
- 2) C6 was changed to 2.7 pF.

### 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)	PPT-105	None	KE3PPT105	None

**TABLE 2**  
**TEST INSTRUMENTS**

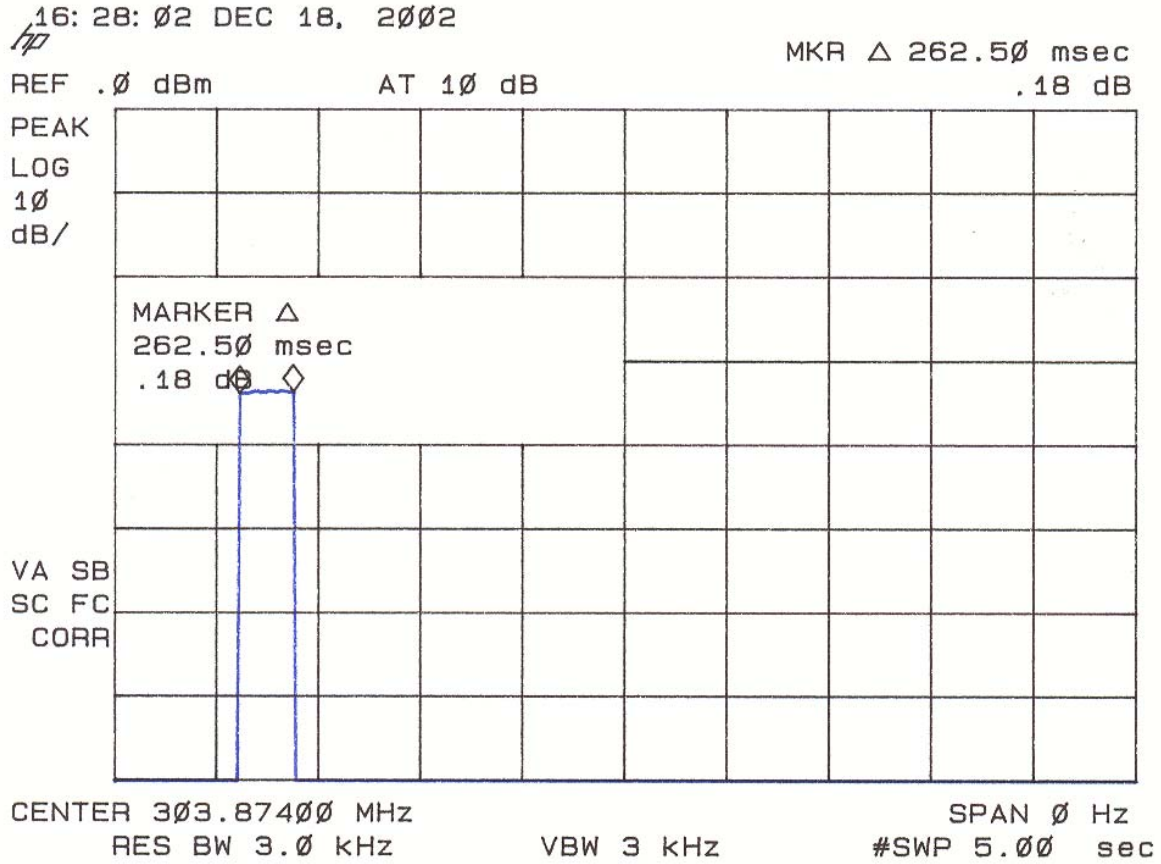
<b>EQUIPMENT</b>	<b>MODEL NUMBER</b>	<b>MANUFACTURER</b>	<b>SERIAL NUMBER</b>	<b>DATE OF LAST CALIBRATION</b>
SPECTRUM ANALYZER	8558B	HEWLETT-PACKARD	2332A09900	3/27/02
SPECTRUM ANALYZER	8558B	HEWLETT-PACKARD	2332A10055	2/15/02
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	2/14/02
COMB GENERATOR	8406A	HEWLETT-PACKARD	2246A02168	10/7/02
RF PREAMP	8447D	HEWLETT-PACKARD	2944A07436	5/6/02
RF PREAMP	8449B	HEWLETT-PACKARD	3008A00480	5/6/02
HORN ANTENNA	3115	EMCO	9107-3723	7/12/02
BILOG ANTENNA	CBL6112B	CHASE	2584	2/31/02
CALCULATION PROGRAM	N/A	N/A	Ver. 5.2	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 2 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.

Bit sequence contains 3 sync pulses (1.0197 msec) and 7 pulse position encoded data bits (0.50983 msec). The 7 data bits consists of 4 ID bits, 1 Function Bit, and 2 shock level bits.

Total TX =  $(3 * 1.0197) + (7 * 0.50983) = 6.62791$  msec every 66.750 msec

Duty Cycle =  $6.62791/66.750 = 9.92\%$

Duty Cycle Correction =  $20 \log (0.0992) = -20.1$  dB

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



## TABLE 3a

## FIELD STRENGTH OF FUNDAMENTAL EMISSION

**Test Date:** September 17, 2002  
**UST Project:** 02-0211  
**Customer:** Radio Systems Corporation  
**Model:** PPT-105

## Peak Measurement

FREQ. (MHz)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	PEAK FCC LIMITS (uV/m) @ 3m
303.825	-34.74	17.8	31,731.6	55,760.4

## SAMPLE CALCULATIONS:

**RESULTS uV/m @ 3m = Antilog  $((-34.74 + 17.8 + 107)/20)$  = 31,731.6**  
**CONVERSION FROM dBm TO dBuV = 107 dB**

**Tested**  
**By:** David P. Blethen **Name:** David Blethen

**TABLE 3b**

**FIELD STRENGTH OF FUNDAMENTAL EMISSION**

**Test Date:** September 17, 2002  
**UST Project:** 02-0211  
**Customer:** Radio Systems Corporation  
**Model:** PPT-105

**Average Measurement**

FREQ. (MHz)	TEST DATA (dBm) @ 3m*	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	AVERAGE FCC LIMITS (uV/m) @ 3m
303.825	-54.84	17.8	3,147.7	5,574.0

\* Duty Cycle Correction =  $20 \log (0.0992) = -20.1 \text{ dB}$

**SAMPLE CALCULATIONS:**

**RESULTS uV/m @ 3m = Antilog  $((-54.84 + 17.8 + 107)/20) = 3,147.7$**   
**CONVERSION FROM dBm TO dBuV = 107 dB**

**Tested**  
**By:** David Blethen **Name:** David Blethen

FIGURE 4

FIELD STRENGTH OF FUNDAMENTAL EMISSION 15.231(b)

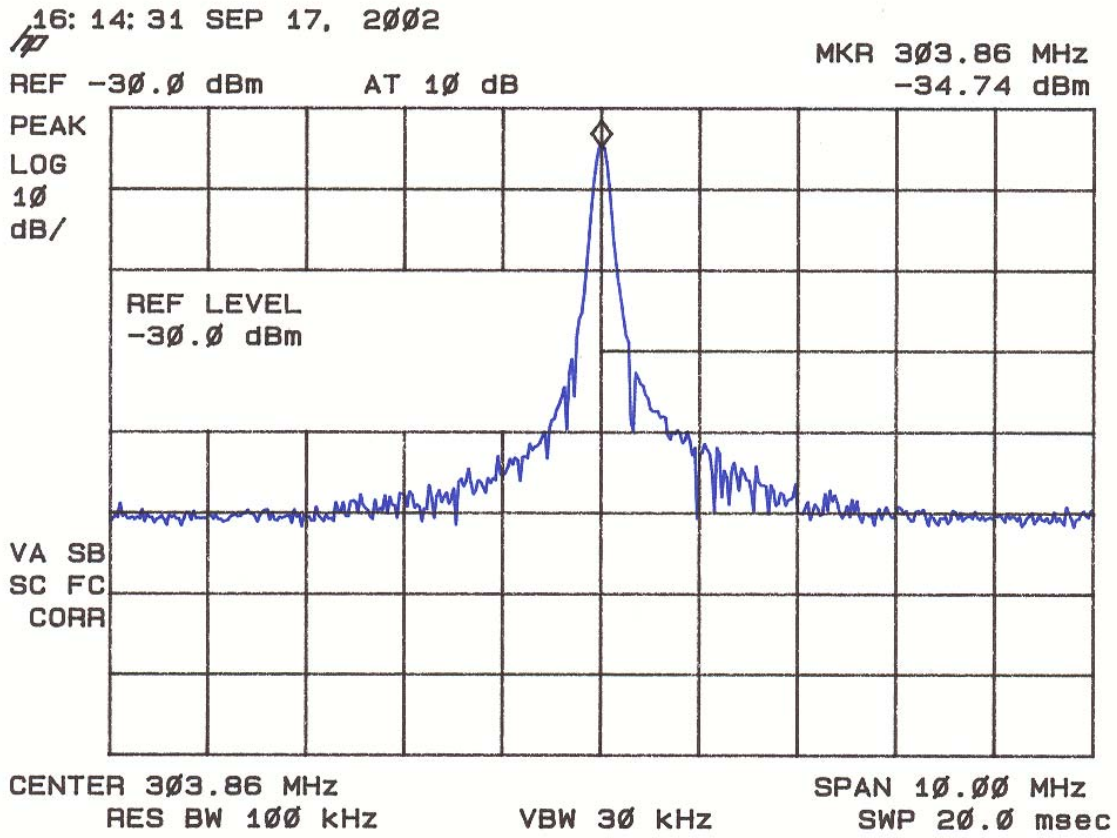


FIGURE 5a

DUTY CYCLE CHARACTERISTICS

11:45:15 SEP 19, 2002

~~17~~

MKR  $\Delta$  1.0197 msec

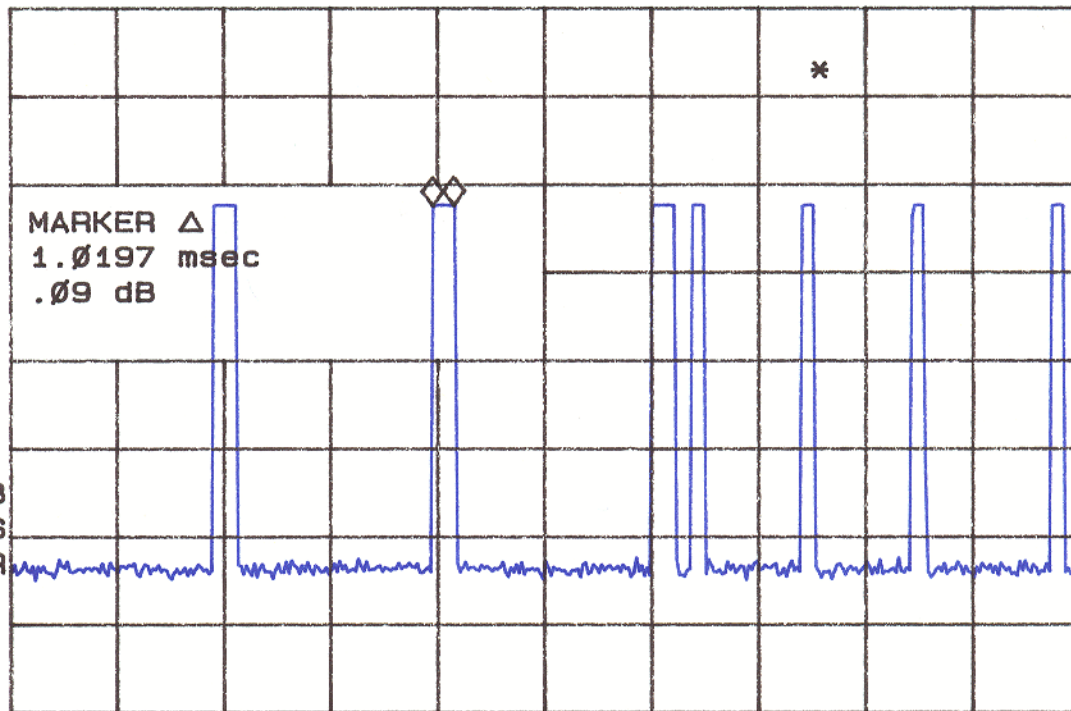
REF -10.0 dBm

AT 10 dB

.09 dB

PEAK  
LOG  
10  
dB/

WA SB  
SC FS  
CORR



CENTER 303.873 MHz

#RES BW 300 kHz

#VBW 30 kHz

SPAN 0 Hz

#SWP 51.0 msec

FIGURE 5b

DUTY CYCLE CHARACTERISTICS

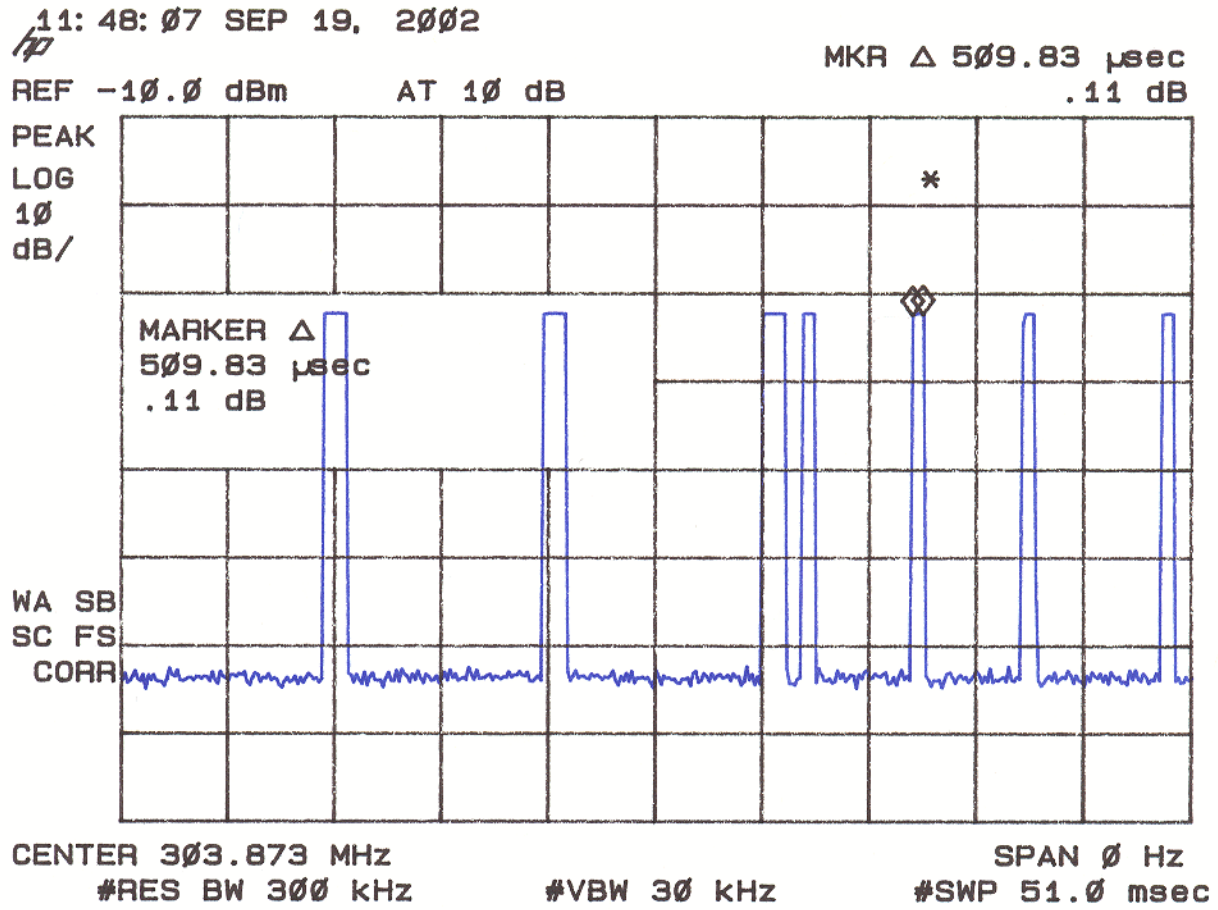


FIGURE 5c

DUTY CYCLE CHARACTERISTICS

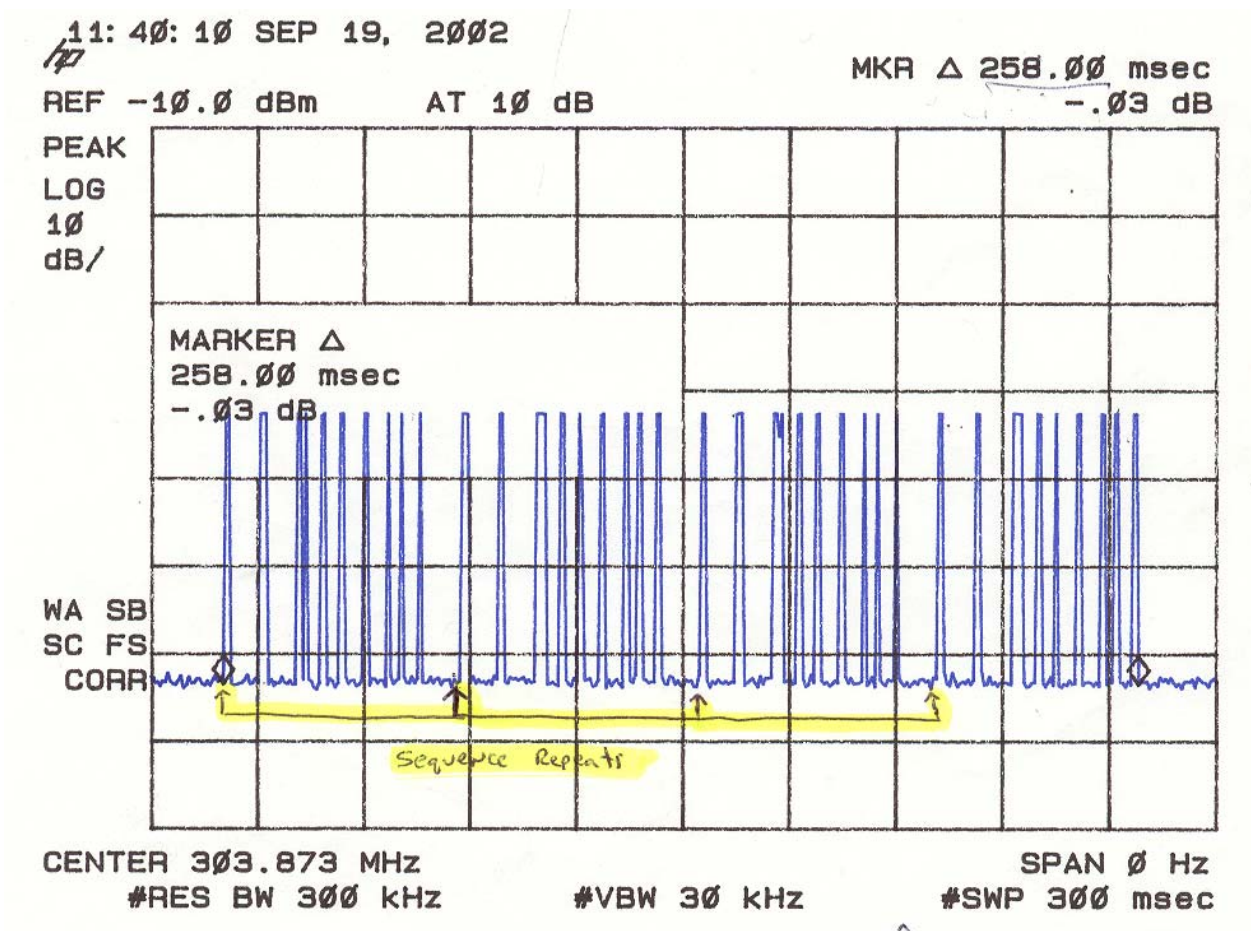


FIGURE 5d

DUTY CYCLE CHARACTERISTICS

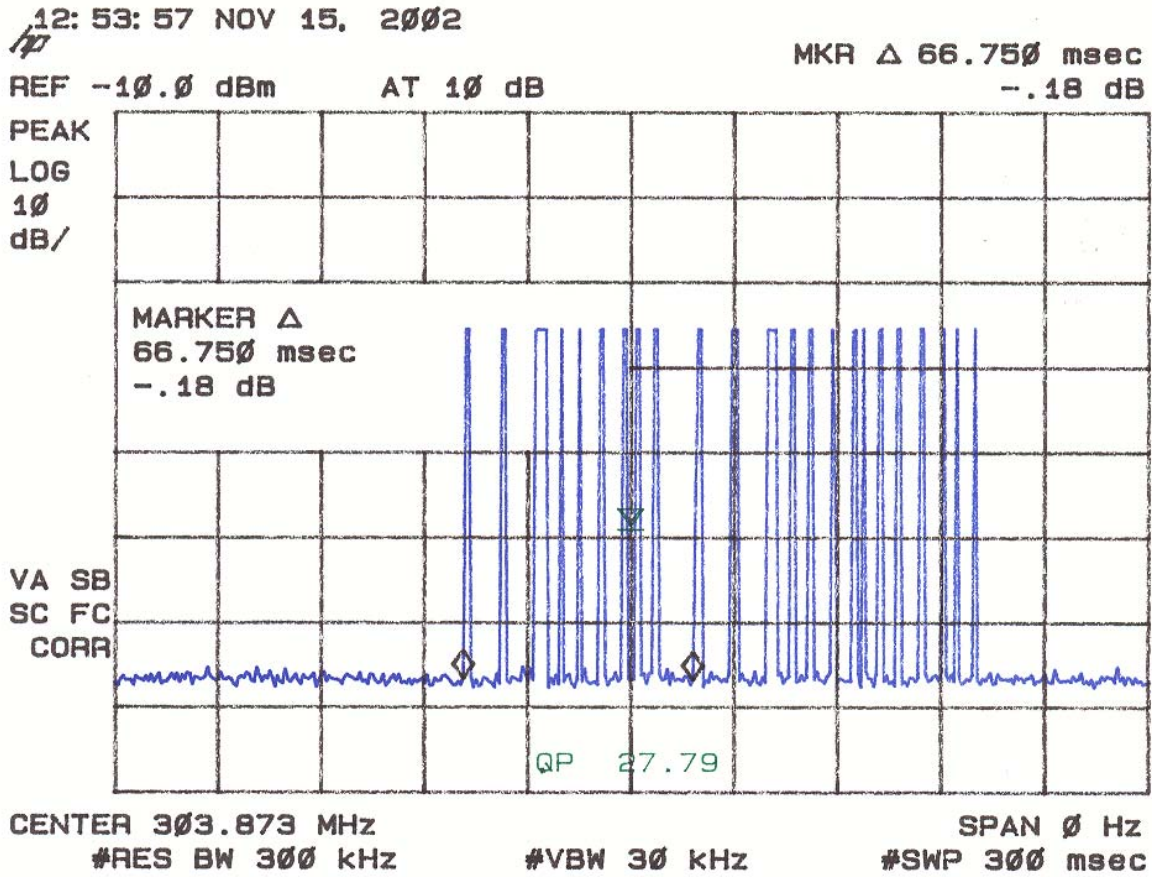


FIGURE 5e

DUTY CYCLE CHARACTERISTICS

11: 17: 36 SEP 19, 2002

~~10~~

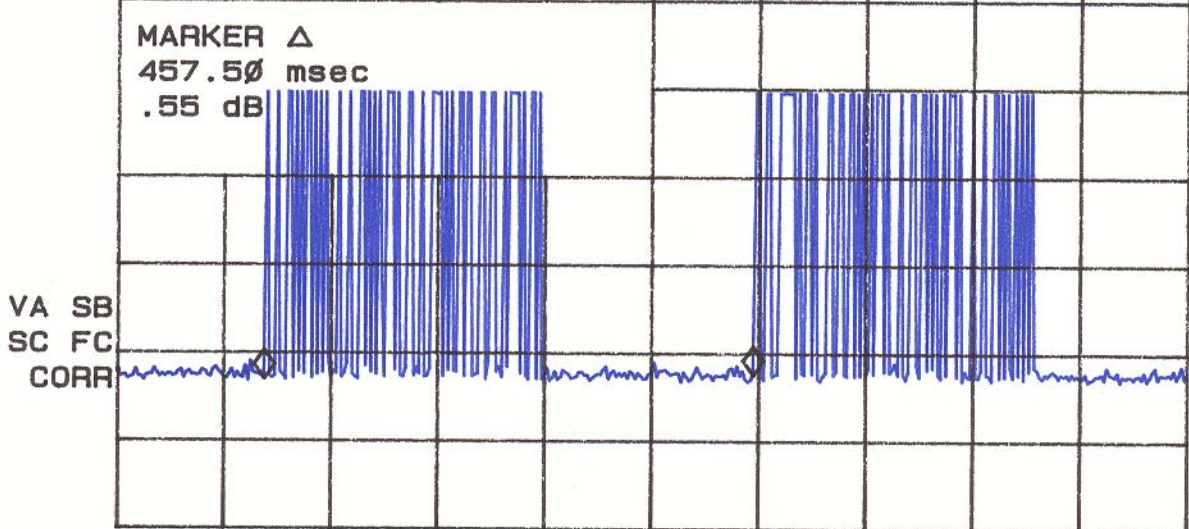
REF -10.0 dBm

AT 10 dB

MKR Δ 457.50 msec

.55 dB

PEAK  
LOG  
10  
dB/



CENTER 303.873 MHz

#RES BW 120 kHz

VBW 300 kHz

SPAN 0 Hz

#SWP 1.00 sec



### **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:** September 18, 2002  
**UST Project:** 02-0211  
**Customer:** Radio Systems Corporation  
**Model:** PPT-105

## Peak Measurement

FREQ. (MHz.)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION - AMP GAIN	RESULTS (uV/m) @ 3m	PEAK FCC LIMITS (uV/m) @ 3m
607.74	-67.7	25.1	1,660.5	5,576.0
911.59	-69.5	29.2	2,167.7	5,576.0
1215.55**	-29.3	-6.3	3,715.4	5,000.0
1519.45**	-29.6	-5.2	4,073.8	5,000.0

\*\* Denotes restricted band of operation

## SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog  $((-67.7 + 25.1 + 107)/20) = 1,660.5$   
 CONVERSION FROM dBm TO dBuV = 107 dB

Tested  
 By: David Blethen Name: David Blethen

TABLE 5b

## FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Date: September 18, 2002  
 UST Project: 02-0211  
 Customer: Radio Systems Corporation  
 Model: PPT-105

## Average Measurement

FREQ. (MHz.)	TEST DATA* (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION - AMP GAIN	RESULTS (uV/m) @ 3m	PEAK FCC LIMITS (uV/m) @ 3m
607.74	-87.8	25.1	165.0	557.6
911.59	-89.6	29.2	213.8	557.6
1215.55**	-49.4	-6.3	367.3	500
1519.45**	-49.7	-5.2	402.7	500

\* Duty Cycle Correction =  $20 \log (0.0992) = -20.1 \text{ dB}$

\*\* Denotes restricted band of operation

## SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m =  $\text{Antilog} ((-87.8 + 25.1 + 107)/20) = 165.0$

CONVERSION FROM dBm TO dBuV = 107 dB

Tested  
 By: David Blethen Name: David Blethen

**FIGURE 6a**

**SPURIOUS EMISSIONS 16.231(b)**

**Plot Not Available**

FIGURE 6b

SPURIOUS EMISSIONS 16.231(b)

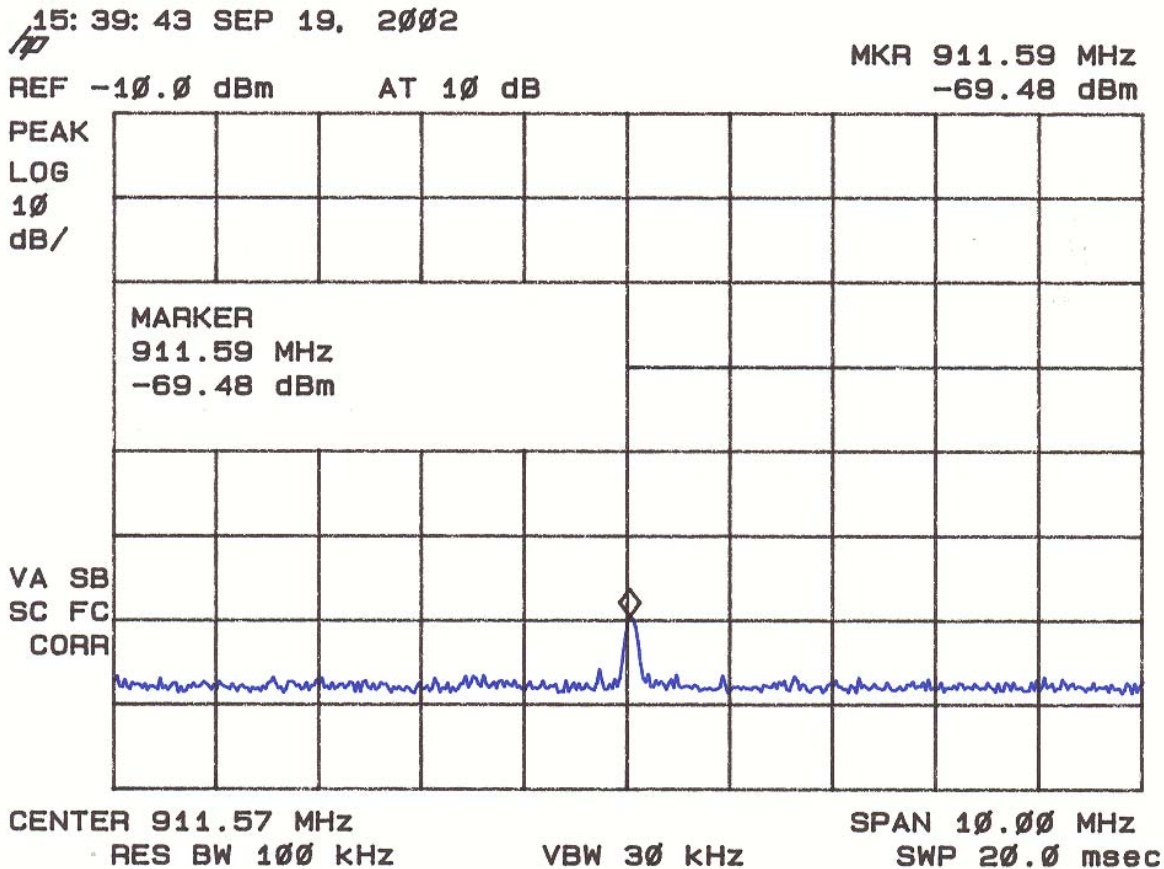


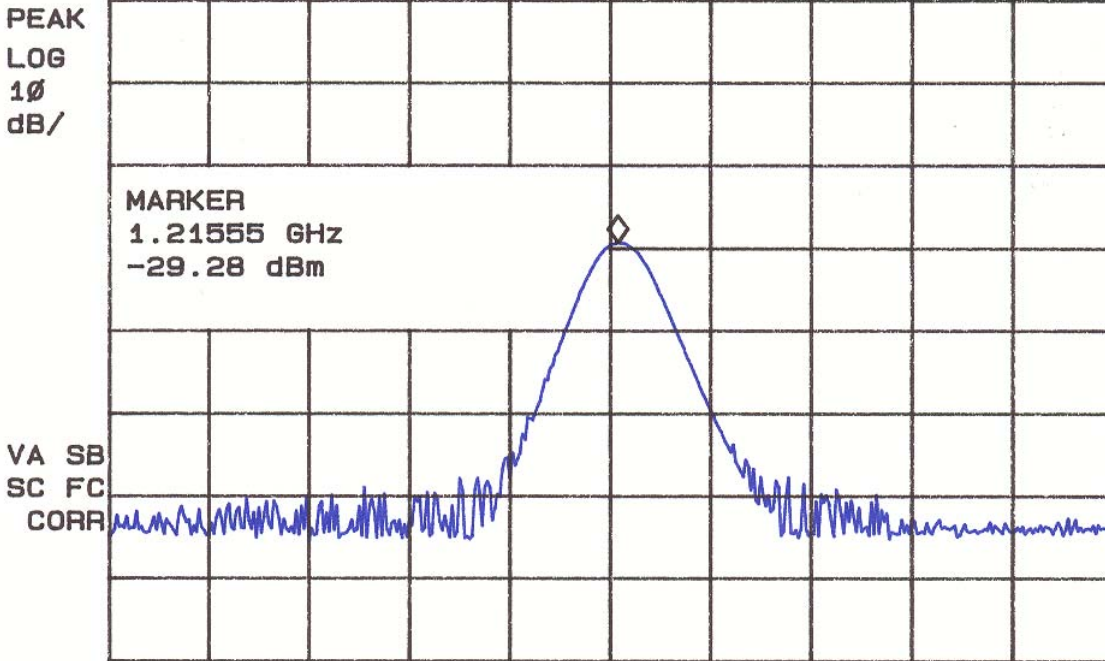
FIGURE 6c

SPURIOUS EMISSIONS 16.231(b)

09:08:51 SEP 20, 2002

MKR 1.21555 GHz  
-29.28 dBm

REF .0 dBm AT 10 dB



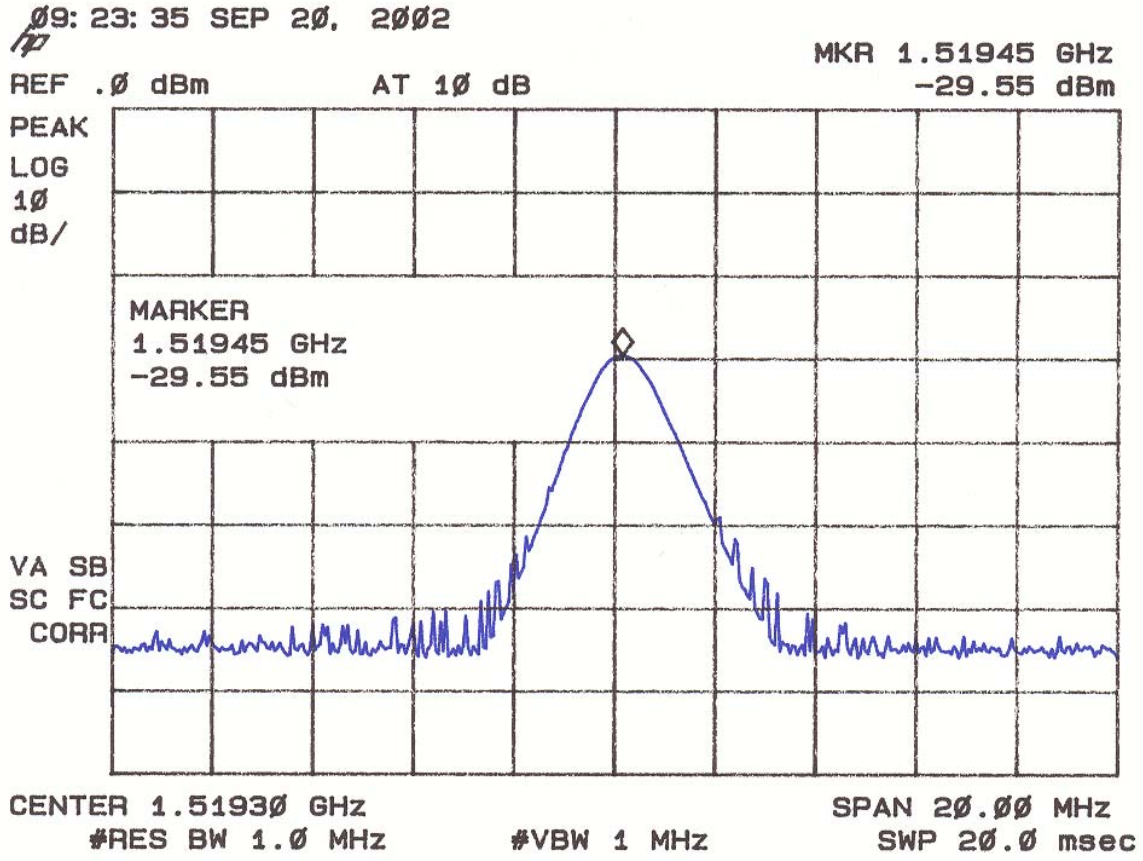
START 1.20540 GHz  
#RES BW 1.0 MHz

#VBW 1 MHz

STOP 1.22540 GHz  
SWP 20.0 msec

FIGURE 6d

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: September 19, 2002  
UST Project: 02-0211  
Customer: Radio Systems Corporation  
Model: PPT-105

FREQUENCY (MHz)	20 dB BANDWIDTH (kHz)	FCC LIMITS (kHz)
303.825	380	759.6

FCC Limit = (0.25%) (Center Frequency) = (0.0025)(303.825 MHz) = 759.6 kHz

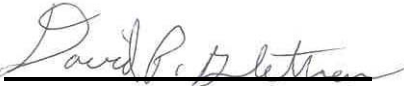
Tested By  
Signature:  Name: David Blethen

FIGURE 7

20 dB BANDWIDTH OF FUNDAMENTAL EMISSION 15.231(c)

11: 11: 57 SEP 19, 2002

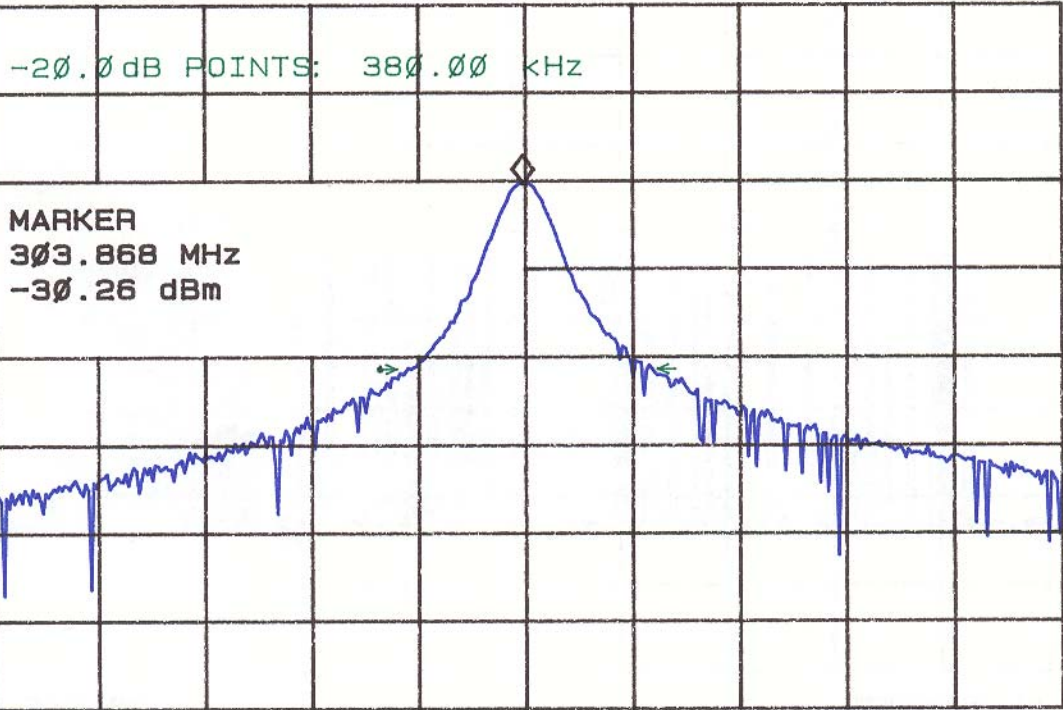
U L

~~HP~~

MKR 303.868 MHz  
-30.26 dBm

REF -10.0 dBm AT 10 dB

PEAK  
LOG  
10  
dB/



CENTER 303.873 MHz  
#RES BW 120 kHz

VBW 300 kHz

SPAN 2.000 MHz  
SWP 20.0 msec

**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 7

CLASS B  
RADIATED EMISSIONS

Test Date: September 20, 2002  
UST Project: 02-0211  
Customer: Radio Systems Corporation  
Model: PPT-105

FREQ. (MHz)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
Since the digital devices circuitry is used only to enable operation of the transmitter and did not control additional functions or capability, testing of digital device emissions was deemed not necessary.				

Tested  
By: David P. Blethen Name: David Blethen

**Power Line Conducted Emissions (47 CFR 15.107a)**

The EUT is operated by internal battery power only, therefore power line conducted emissions was deemed unnecessary.