



**Radio Systems Corporation
FCC Part 15, Certification Application
Model PPT-102RB**

December 5, 2002

MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: Radio Systems Corporation

MODEL: PPT-102RB

FCC ID: KE3PPT102RB

DATE: December 5, 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 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 (1992). 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) C5 was changed from 4.7 to 2.7 pF.

Test Equipment

Table 2 describes test equipment used to evaluate this product.

FIGURE 1
TEST CONFIGURATION

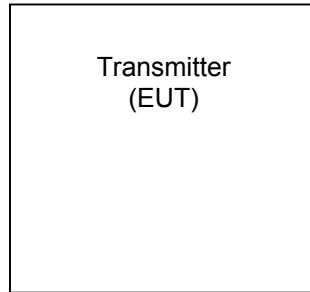


FIGURE 2a

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-102RB | None | KE3PPT102RB | None |

TABLE 2

TEST INSTRUMENTS

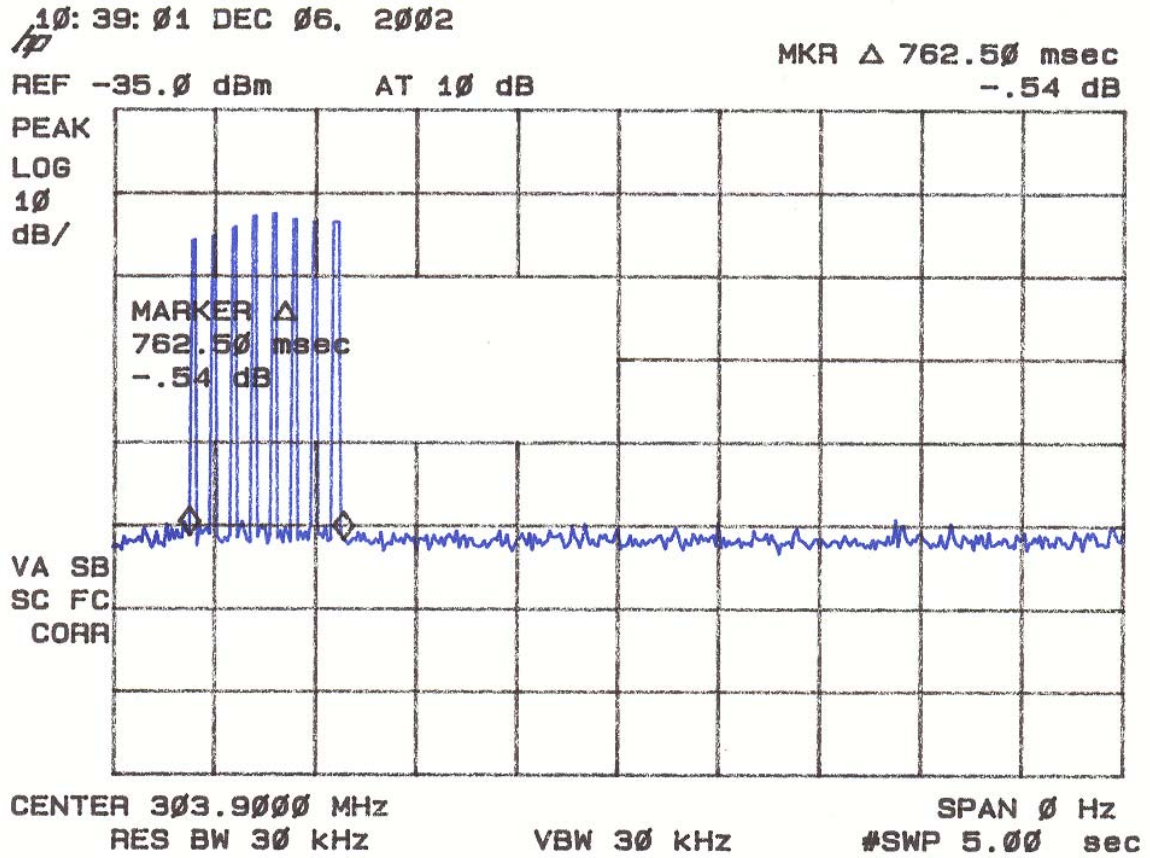
| EQUIPMENT | MODEL NUMBER | MANUFACTURER | SERIAL NUMBER | DATE OF LAST CALIBRATION |
|----------------------|--------------|-----------------|---------------|--------------------------|
| SPECTRUM ANALYZER | 8558B | HEWLETT-PACKARD | 2332A09900 | 3/27/02 |
| SPECTRUM ANALYZER | 8558B | HEWLETT-PACKARD | 2332A10055 | 2/15/02 |
| SPECTRUM ANALYZER | 8593E | HEWLETT-PACKARD | 3205A00124 | 2/14/02 |
| SIGNAL GENERATOR | 8648B | HEWLETT-PACKARD | 3642U01679 | 08/22/01 |
| 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 |
| BICONICAL ANTENNA | 3110 | EMCO | 9307-1431 | 7/23/02 |
| LOG PERIODIC ANTENNA | 3146 | EMCO | 3236 | 11/26/01 |
| 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 3 button transmitter. The EUT continues to transmit while each button is being pressed. The EUT ceases transmission < 1 second 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 3 and Figure 4.

Duty Cycle Correction During 100 msec:

For detailed information regarding the duty cycle, please see Figures 5a through 5d. The transmission packet consists of a header followed by 12 pulse position encoded pulses (1.4 msec + 12 * 0.510 ms = 7.52 msec per 100 msec)

Duty Cycle Correction = $20 \log (0.0752) = -22.5 \text{ dB}$

Field strength of the average fundamental emission is shown in Table 4.

TABLE 3

FIELD STRENGTH OF FUNDAMENTAL EMISSION

Test Date: October 29, 2002
UST Project: 02-0209
Customer: Radio Systems Corporation
Model: PPT-102RB

Peak Measurement

| FREQ. (GHz) | TEST DATA (dBm) @ 3m | ANTENNA FACTOR + CABLE ATTENUATION | RESULTS (uV/m) @ 3m | PEAK FCC LIMITS (uV/m) @ 3m |
|----------------|----------------------------|--|---------------------------|--------------------------------------|
| 303.825 | -29.88 | 17.8 | 55533.9 | 55760.0 |

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog $((-29.88 + 17.8 + 107)/20) = 55533.9$
CONVERSION FROM dBm TO dBuV = 107 dB

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

TABLE 4

FIELD STRENGTH OF FUNDAMENTAL EMISSION

Test Date: October 29, 2002
UST Project: 02-0209
Customer: Radio Systems Corporation
Model: PPT-102RB

Average Measurement

| FREQ. (MHz) | TEST DATA (dBm) @ 3m* | ANTENNA FACTOR + CABLE ATTENUATION | RESULTS (uV/m) @ 3m | AVERAGE FCC LIMITS (uV/m) @ 3m |
|----------------|-----------------------------|--|---------------------------|---|
| 303.825 | -52.38 | 17.8 | 4164.5 | 5576.0 |

* Duty Cycle Correction = $20 \log (0.0752) = -22.5 \text{ dB}$

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog $((-52.38 + 17.8 + 107)/20) = 4164.5$
CONVERSION FROM dBm TO dBuV = 107 dB

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

FIGURE 4

FIELD STRENGTH OF FUNDAMENTAL EMISSION 15.231(b)

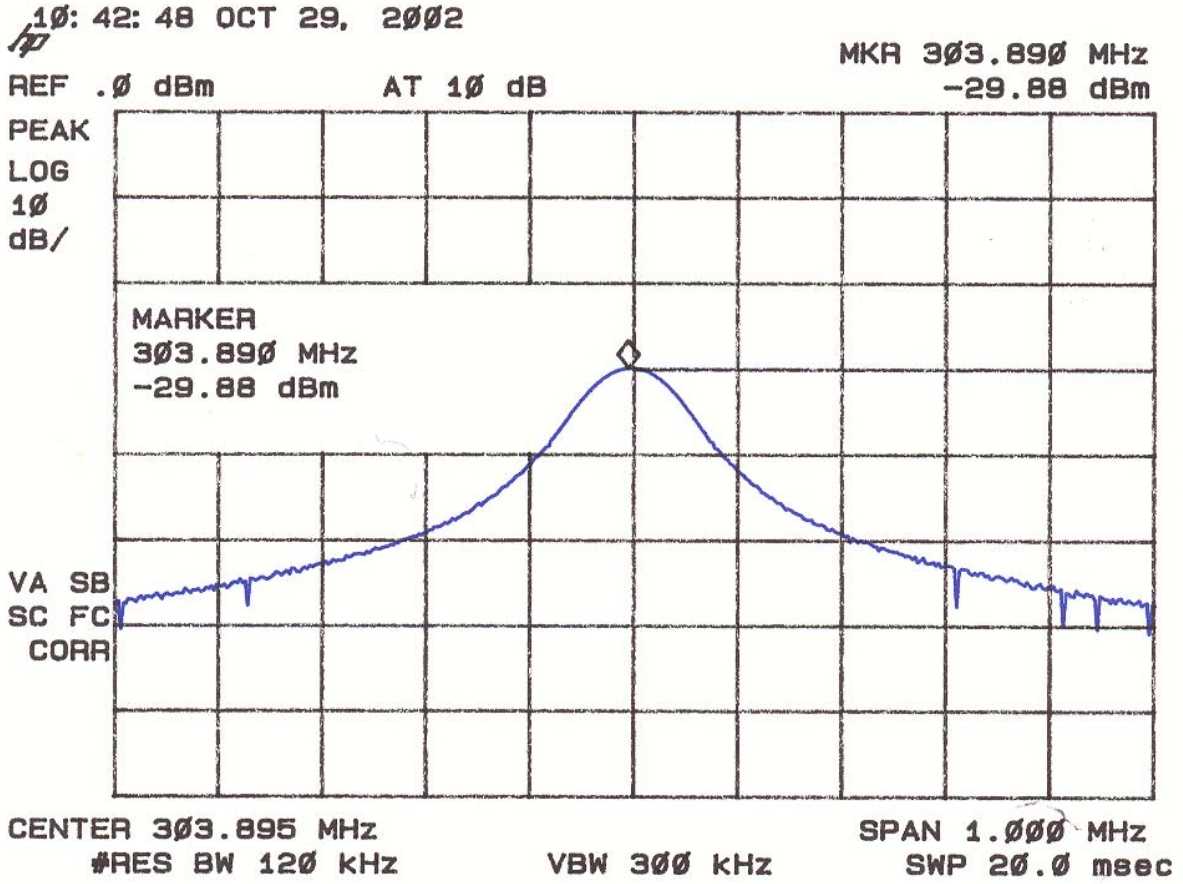


FIGURE 5a

DUTY CYCLE CHARACTERISTICS

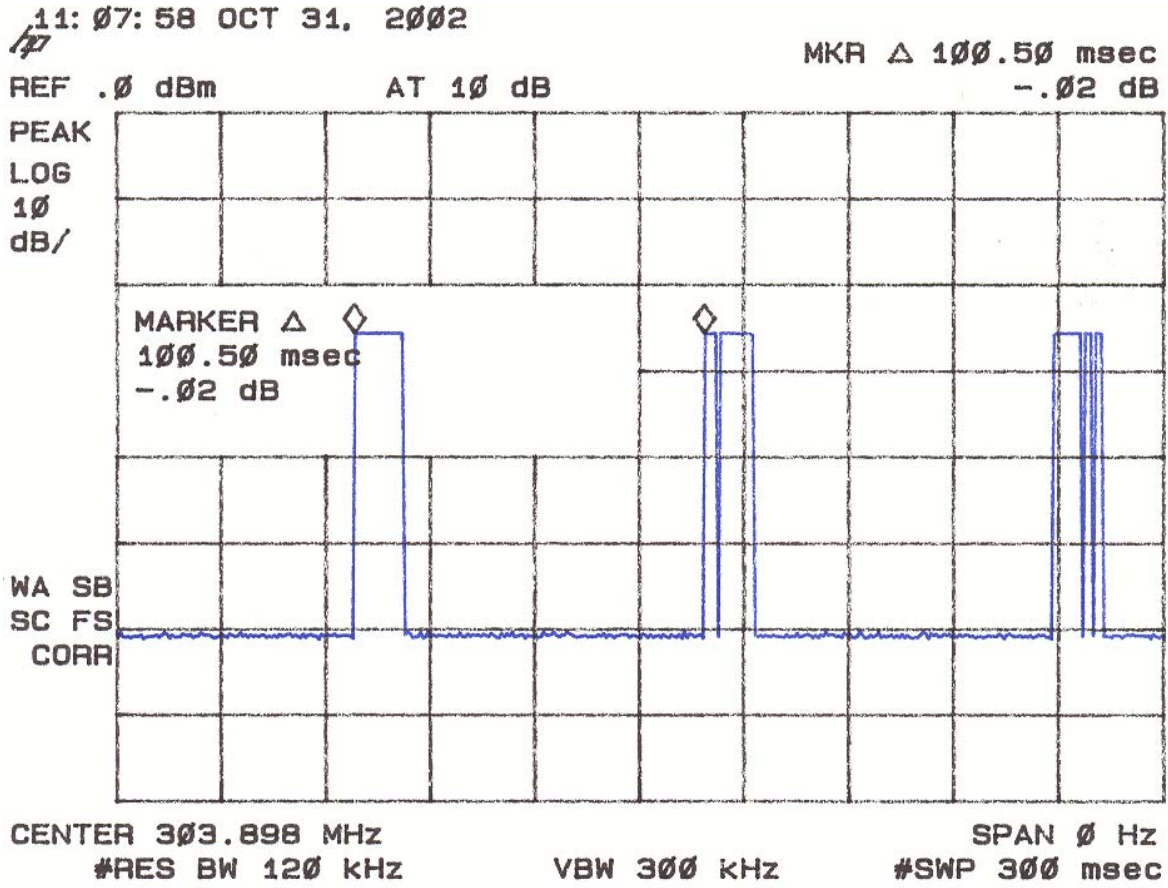


FIGURE 5b

DUTY CYCLE CHARACTERISTICS

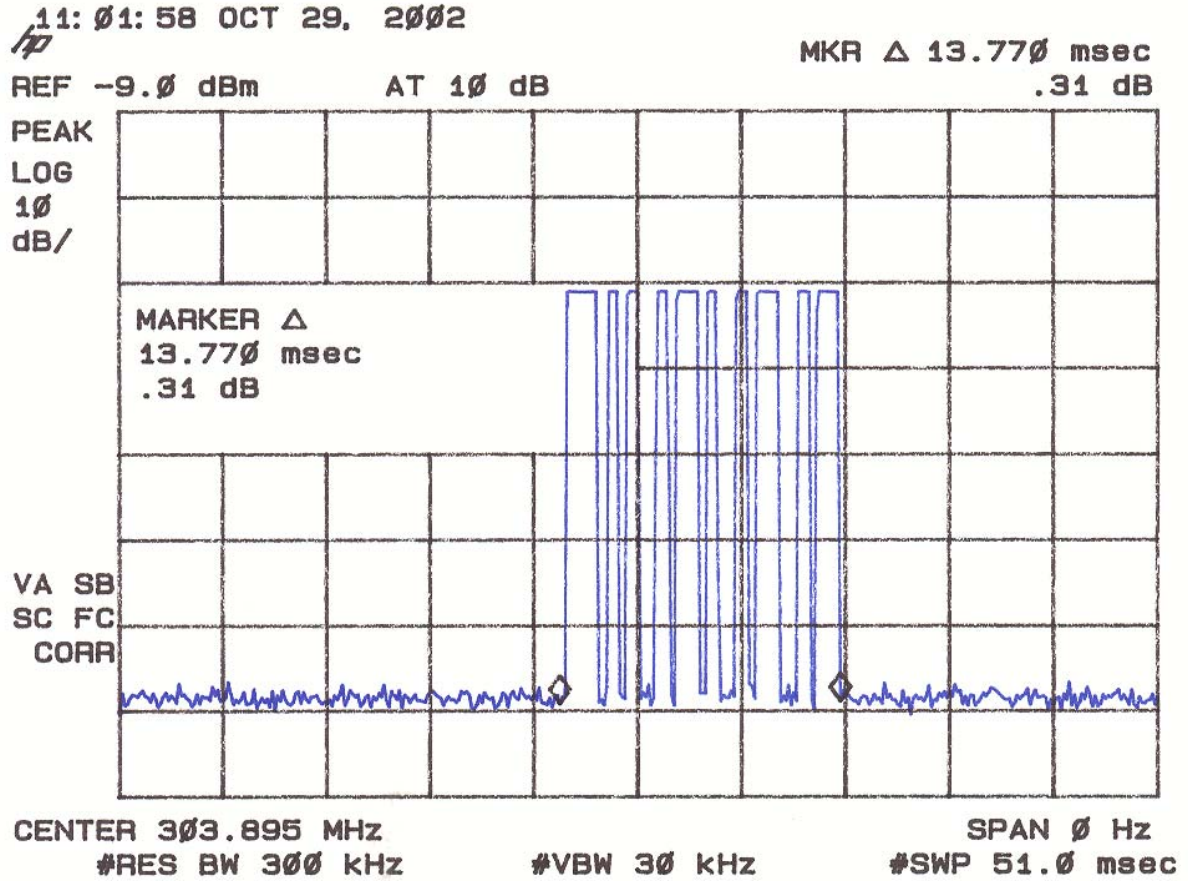


FIGURE 5c

DUTY CYCLE CHARACTERISTICS

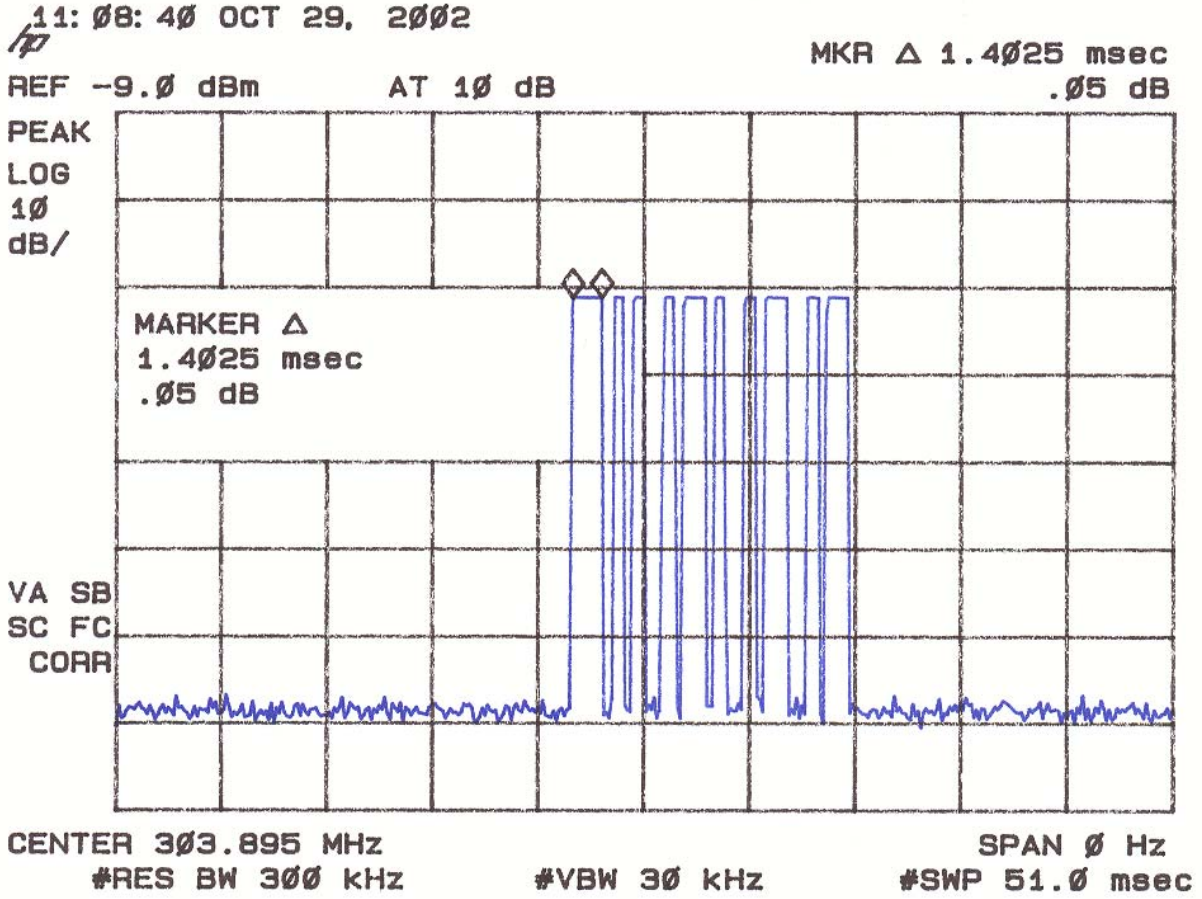
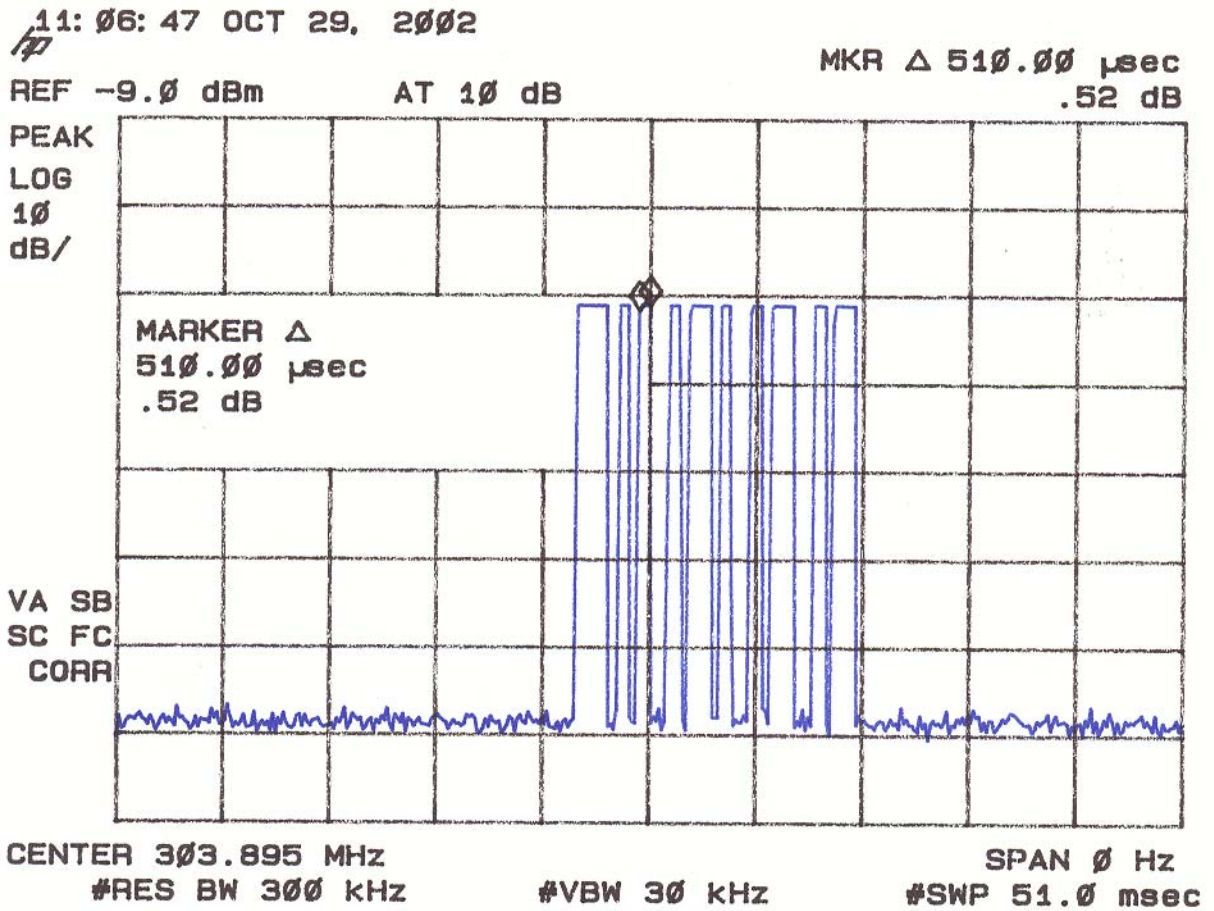


FIGURE 5d

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.

Analyzer Settings:

30 – 1000 MHz

Peak Measurements, RBW = 120 kHz, VBW = Auto

Greater than 1000 MHz

Peak Measurements, RBW = 1 MHz, VBW = 1 MHz

TABLE 5a

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Date: October 29, 2002
UST Project: 02-0209
Customer: Radio Systems Corporation
Model: PPT-102RB

Peak Measurement

| FREQ. (MHz.) | TEST DATA (dBm) @ 3m | ANTENNA FACTOR + CABLE ATTENUATION - AMP GAIN | RESULTS (uV/m) @ 3m | PEAK FCC LIMITS (uV/m) @ 3m |
|-----------------|----------------------------|---|---------------------------|--------------------------------------|
| 0.6078 | -69.92 | 25.1 | 1277.2 | 5576.0 |
| 0.9117 | -76.96 | 29.2 | 919.2 | 5576.0 |
| 1.21548 ** | -39.87 | -6.3 | 1101.7 | 5000.0 |
| 1.51948 ** | -35.66 | -5.2 | 2026.8 | 5000.0 |
| 1.82335 | -56.25 | -2.9 | 246.2 | 5576.0 |

** - Denotes a Restricted Band of Operation

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog $((-69.92 + 25.1 + 107)/20) = 1277.2$
 CONVERSION FROM dBm TO dBuV = 107 dB

Tested
 By: David Blethen Name: David Blethen

TABLE 5b

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Date: October 2 & 28, 2002
UST Project: 02-0209
Customer: Radio Systems Corporation
Model: PPT-102RB

Average Measurement

| FREQ. (MHz.) | TEST DATA (dBm) @ 3m* | ANTENNA FACTOR + CABLE ATTENUATION - AMP GAIN | RESULTS (uV/m) @ 3m | AVERAGE FCC LIMITS (uV/m) @ 3m |
|-----------------|-----------------------------|---|---------------------------|---|
| 0.6078 | -92.43 | 25.1 | 96.2 | 557.6 |
| 0.9117 | -99.46 | 29.2 | 68.7 | 557.6 |
| 1.21548 ** | -62.37 | -6.3 | 82.6 | 500.0 |
| 1.51948 ** | -61.50 | -5.2 | 103.5 | 500.0 |
| 1.82335 | -78.75 | -2.9 | 18.5 | 557.6 |

* - Duty Cycle Correction = $20 \log(0.0752) = -22.5$ dB

** - Denotes a Restricted Band of Operation

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = $\text{Antilog}((-92.43 + 25.1 + 107)/20) = 96.2$
 CONVERSION FROM dBm TO dBuV = 107 dB

Tested
 By: David Blethen Name: David Blethen

FIGURE 6

SPURIOUS EMISSIONS 16.231(b)

Plots Not Available

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: December 2, 2002
UST Project: 02-0209
Customer: Radio Systems Corporation
Model: PPT-102RB

| FREQUENCY (MHz) | 20 dB BANDWIDTH (kHz) | FCC LIMITS (kHz) |
|--------------------|--------------------------|---------------------|
| 303.825 | 420 | 760 |

FCC Limit = (0.25%) (Center Frequency) = (0.0025)(303.825 MHz) = 760 kHz

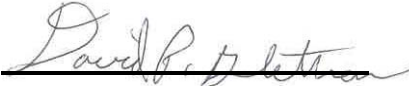
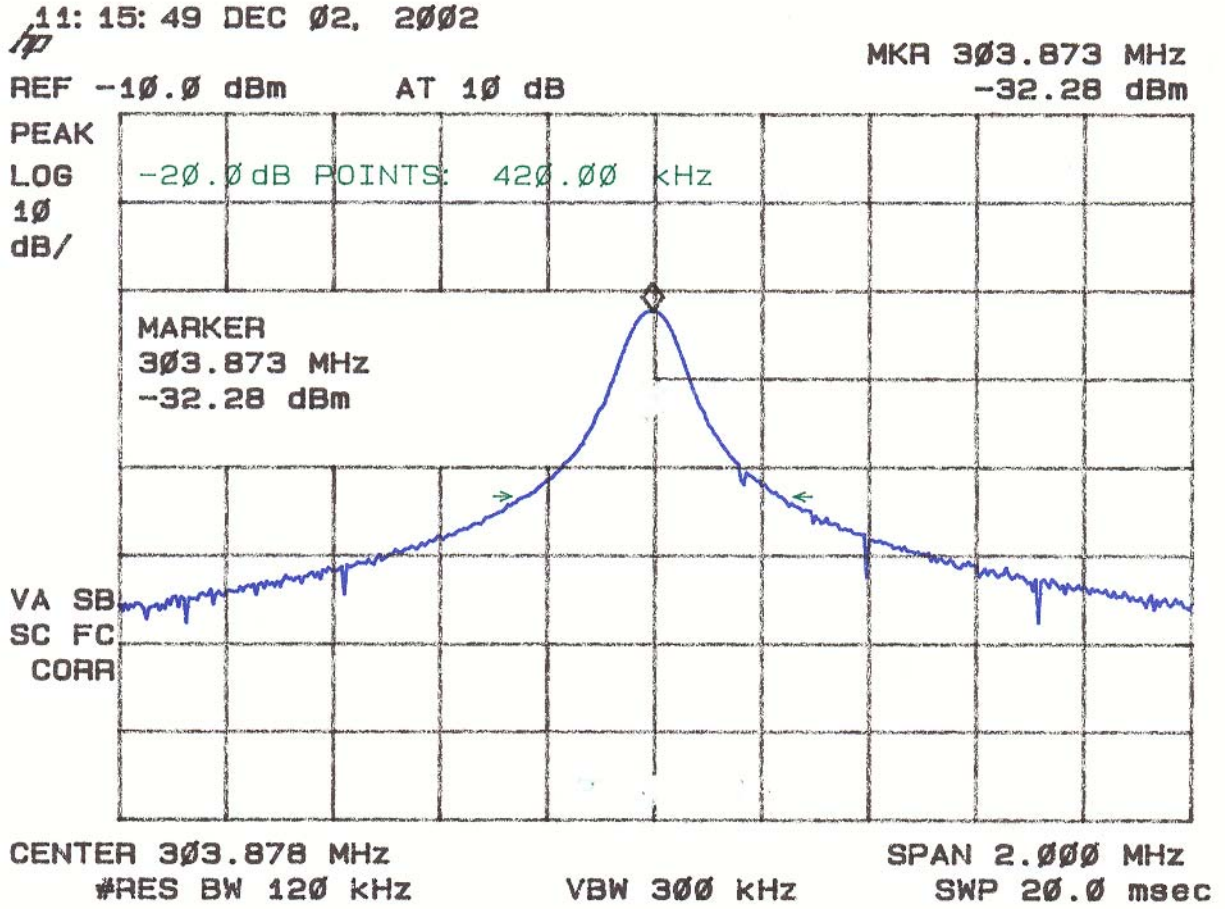
Tested By
Signature:  Name: David Blethen

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 7

**CLASS B
RADIATED EMISSIONS**

Test Date: October 29, 2002
UST Project: 02-0209
Customer: Radio Systems Corporation
Model: PPT-102RB

| FREQ. (MHz) | TEST DATA (dBm) @ 3m | ANTENNA FACTOR + CABLE ATTENUATION | RESULTS (uV/m) @ 3m | FCC LIMITS (uV/m) @ 3m |
|--|----------------------------|--|---------------------------|------------------------------|
| <p>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.</p> | | | | |

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.