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L. S. Compliance, Inc.

Compliance Testing of:

Spray commander

Pet Training System

Prepared for:

Radia Technology Limited

Test Report Number: 300214

Date(s) of Testing: May 15, June 14, 2000

***All results of this report relate only to the items that were tested.
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DESCRIPTION OF MEASUREMENT FACILITIES

Site on File with the FCC

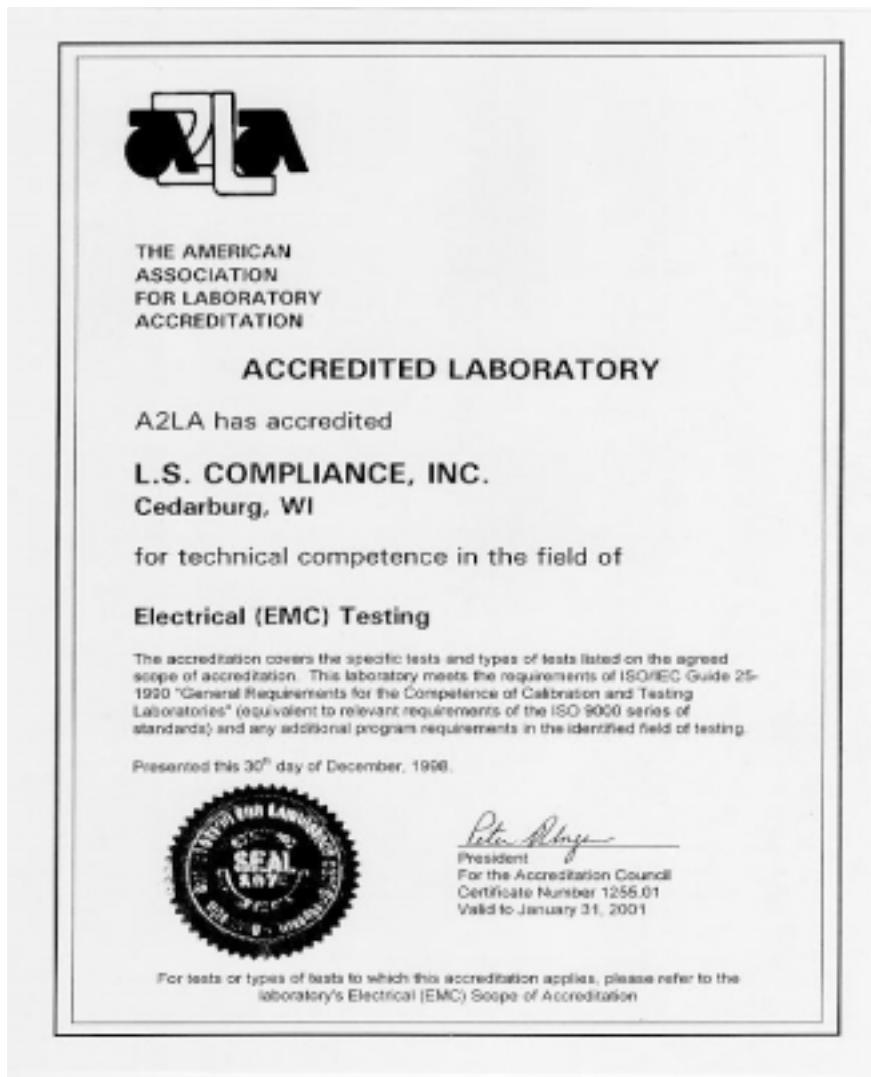
ID Number: 31040/SIT

1300F2

Site on file with Industry Canada:

ID Number: IC 3088

“ The site referenced above has been found to comply with the test site criteria found in ANSI C63.4-1992 and 47CFR Section 2.948. ”





SIGNATURE PAGE

Tests performed by:

Prepared By:

Approved By:

June 21,
2000

Kenneth L. Boston, EMC Lab Manager
PE #31926
Registered Professional Engineer
(State of Wisconsin)

Date



1.3 SUMMARY OF TEST REPORT

| | |
|------------------|--|
| MANUFACTURER: | Radia Technology Limited |
| MODEL: | Multivet- Spray Commander |
| SERIAL: | not applied |
| DESCRIPTION: | remote control for a pet training system |
| FREQUENCY RANGE: | TRANSMITTER; 912.0 Mhz fixed frequency |

The Spray commander remote control transmitter was found to **meet** the radiated emission specification of Title 47 CFR FCC, Part 15, subpart C. for an intentional radiator



1.4 INTRODUCTION

On May 15 and June 14 of 2000, a series of Radiated Emissions tests were performed on two sample models of the spray commander transmitter, a small handheld unit which is designed to transmit a coded signal used to activate a pet training spray module. These tests were performed using the test procedures outlined in ANSI C63.4-1992 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.249 for a low powered transmitter. These tests were performed by Kenneth L. Boston, PE, of L. S. Compliance, Inc.

1.5 PURPOSE

The above mentioned tests were performed in order to determine the compliance of the Spray Commander with limits contained in various provisions of Title 47 CFR, FCC Part 15, including:

| | |
|--------|--------|
| 15.109 | 15.249 |
| 15.205 | |
| 15.209 | |

All radiated emissions tests were performed to measure the emissions in the frequency bands described by the above sections, and to determine whether said emissions are below the limits established by the above sections. These tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-1992). Another document used as reference for the EMI receiver specification was the International Special Committee on Radio Interference (CISPR) number 16-1 (1993).

1.6 RADIATED EMISSIONS TEST SETUP

The test sample was operated within the 3 meter Semi-Anechoic, FCC listed chamber located at L.S. Compliance in Cedarburg, WI. The sample was placed on an 80cm high wooden pedestal, which was centered on the flush-mounted 2m diameter metal turntable. The test sample was operated on its own [new] internal battery. The battery voltage at the beginning of the tests was measured to be 6.5 volts. One of the test samples contained modified software, allowing it to transmit a continuous modulated signal, in order to facilitate measurement of the fundamental, spurious and harmonic emissions. The other test sample was left as manufactured, with the transmitter sending out one short burst whenever the keypad was depressed.

Please refer to Section 1.11 for pictures of the test setup.



1.7 RADIATED EMISSION TEST PROCEDURE

The fundamental and spurious (harmonic) emissions of the transmitter were tested for compliance to Title 47 CFR, FCC Part 15.249 limits for low powered (ISM) devices. For the calculations used to determine the limits applicable for the two test samples, refer to Appendix A. These limits are expressed in decibels (dB) above 1 microvolt per meter ($\mu\text{V}/\text{m}$). The samples were tested from the lowest frequency generated by the transmitter (without going below 9 kHz) to the 10th harmonic of the fundamental frequency generated by the device. The appropriate limits were also observed when any spurious signals were located within any of the restricted bands as described in Part 15.205a. These frequencies, and their associated limits, are referenced in Section 1.10. The samples were placed on a nonconductive (wooden) pedestal in the 3 Meter chamber and the antenna mast was placed such that the antenna was 3m (1 meter from 1 to 9 ghz) from the test object. A biconical antenna or tuned dipole was used to measure emissions from 30 to 200 MHz, a log periodic or tuned dipole was used to measure emissions from 200 to 1000 MHz, and a double ridged waveguide horn was used to measure emissions above 1 GHz. The test object was programmed to operate in continuous transmit, and the resultant signals were maximized by rotating the turntable 360 degrees, and by raising and lowering the antenna between 1 and 4 meters. The test object was also given several different orientations to determine the maximum signal levels, using both horizontal and vertical antenna polarities.

No significant emissions were found aside from the transmitter fundamental and several harmonics, plus some low level spurious (reference oscillator) signal near the fundamental carrier. The unit was scanned for emissions while in continuous transmit, over the range 30 to 10,000 MHz to establish compliance with Part 15.209 and 15.249.



1.8 TEST EQUIPMENT UTILIZED FOR RADIATED EMISSIONS TEST

A list of the test equipment, cables and antennas used for the tests can be found in Section 1.13, which includes the calibration information as well as the equipment description. All equipment is calibrated and used according to the user manuals supplied by the manufacturer. All antenna calibrations were performed at a N.I.S.T traceable site, and the resultant correction factors were entered into the Hewlett Packard 8546A EMI receiver software database. The connecting cables used were also measured for loss using a calibrated signal generator and the HP 8546A EMI receiver. The resulting loss factors were entered into the HP 8546A database. This allowed for automatic changes in the antenna correction factor, as well as cable loss or other corrections, to be added to the EMI receiver display while taking measurements. Thus, the resulting data taken from the HP 8546A is an actual reading and can be entered into the database as a corrected meter reading. The HP 8546A EMI receiver was operated with a bandwidth of 120 kHz when receiving signals below 1 GHz, and with a bandwidth of 1 MHz when receiving signals above 1 GHz, in accordance with CISPR 16. Both the Quasi-peak and Average detector functions were used.

1.9 CONDUCTED EMISSION TEST

Due to the fact that this product operated on its own internal battery power, as opposed to using a power cord, it was not necessary to perform a test for Conducted Emissions.



Manufacturer: Radia Technology Limited

Model: Spray Commander

Serial Number(s): not applied

1.10 - Restricted Bands affecting this product

| Frequency (MHz) | Limit (μ V) | Limit (dB/ μ V/m) |
|-----------------|------------------|-----------------------|
| 960-1240 | 500 | 54.0 |
| 1300-1427 | 500 | 54.0 |
| 1435-1626.5 | 500 | 54.0 |
| 1645.5-1646.5 | 500 | 54.0 |
| 1660-1710 | 500 | 54.0 |
| 1718.8-1722.2 | 500 | 54.0 |
| 2200-2300 | 500 | 54.0 |
| 2310-2390 | 500 | 54.0 |
| 2483.5-2500 | 500 | 54.0 |
| 2655-2900 | 500 | 54.0 |
| 3260-3267 | 500 | 54.0 |
| 3332-3339 | 500 | 54.0 |
| 3345.8-3358 | 500 | 54.0 |
| 3600-4400 | 500 | 54.0 |
| 4500-5150 | 500 | 54.0 |
| 5350-5460 | 500 | 54.0 |
| 7250-7750 | 500 | 54.0 |
| 8025-8500 | 500 | 54.0 |
| 9000-9200 | 500 | 54.0 |



1.11 – Photos taken during testing



View of the Spray Commander transmitter during the Radiated Emissions tests. This view shows the orientation of the product corresponding to zero degrees azimuth in position. (horizontal polarity).



1.12 SUMMARY OF RESULTS AND CONCLUSIONS

Based on the procedures outlined in this report, and the test results included in appendices B and C, it can be determined that the Spray Commander transmitter does **meet** the emission requirements of Title 47 CFR, FCC Part 15 Subpart C for an intentional radiator. The level of fifth harmonic emission of the sample was found to be only 1.1 dB below the limit in the worst case configuration. As this level is within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

The enclosed test results pertain to the samples of the test item listed, and only for the tests performed on the data sheets. Any subsequent modification or changes to the test items could invalidate the data contained herein, and could therefore invalidate the findings of this report.

1.13 - Test Equipment, cables used

| Asset # | Manufacturer | Model # | Serial# | Description | Due Date |
|----------|--------------|------------|------------|----------------------------------|-------------|
| AA960004 | EMCO | 3146 | 9512-4276 | Log Periodic Antenna | 3aug2000 |
| AA960005 | EMCO | 3110B | 9601/2280 | Biconical Antenna | 3aug2000 |
| AA960007 | EMCO | 3115 | 99111-4198 | Double Ridge Horn Antenna | 1aug2000 |
| EE960004 | EMCO | 2090 | 9607-1164 | Mast/Ttable controller | I.O. |
| EE960014 | HP | 85460 | 3617A00320 | EMI receiver Display section | 23aug2000 |
| EE960013 | HP | 85462 | 3205A00103 | EMI receiver Preselector section | 23aug2000 |
| CC000221 | HP | E4407b | Us39160256 | 26.5 GHz Spectrum Analyzer | 16june2000 |
| N/a | LSC | Cable | 0011 | 3 meter 1/2 " heliax Cable | 23 Aug 2000 |
| N/a | LSC | Cable | 0038 | 1 meter RG214 Cable | 7 June 2000 |
| N/a | LSC | cable | 0050 | 10 meter RG214 Cable | 7 June 2000 |
| N/a | LSC | attenuator | -- | 10 db attenuator | 7 June 2000 |



APPENDIX A:

CALCULATIONS

Manufacturer: Radia Technology Limited

Model: Spray Commander

Serial Number(s): not applied

Calculation of Radiated Emissions limits for FCC Part 15.249

FIELD STRENGTH OF FUNDAMENTAL FREQUENCIES:

FIELD STRENGTH OF SPURIOUS/HARMONIC FREQUENCIES:

- ❖ Where $f_0 = 912$ MHz
 - Fundamental: $= 50,000 \mu\text{V}/\text{m} = 94.0 \text{ dBuV}/\text{m}$
 - Harmonic: $= 500 \mu\text{V}/\text{m} = 54.0 \text{ dBuV}/\text{m}$

For other out-of band spurious signals, the 15.209 general limits apply:

216-960 MHz = $200 \mu\text{V}/\text{m} = 46 \text{ dB}\mu\text{V}/\text{m}$

960-10,000 MHz = $500 \mu\text{V}/\text{m} = 54.0 \text{ dB}\mu\text{V}/\text{m}$



APPENDIX B:

DATA CHARTS

Measurement of Electromagnetic Radiated Emission within 3 Meter FCC Listed

Chamber

Frequency Range inspected: 30 to 3500 MHz

| | | | |
|------------------------|---|-------------------|---|
| Date of Test: | May 15, June 14, 2000 | Manufacturer: | Radia Technology ltd |
| Location: | L.S. Compliance, Inc. W66 N220 Commerce Court Cedarburg, WI 53012 | Model No.: | Spray Commander |
| Specification s: | Title 47CFR, FCC Part 15.231b | Serial No.: | Not applied |
| Distance: | 3 meters, 1 meter | Configuration: | Active, continuous modulated carrier |
| Equipment: | HP 8546A EMI Receiver EMCO 3115 Double Ridged Waveguide EMCO 3146A Log Periodic | Detector(s) Used: | Quasi-peak below 1 GHz Average above 1 GHz |
| Laboratory Conditions: | Temperature: 68-74 deg F Humidity: 35-50%, | | Pressure: 680-1060mbr |

The following table depicts the level of significant fundamental and harmonic emissions found:

Harmonics greater than 20 dB below the limit were not reported.:

| Frequency (MHz) | Antenna Polarity | Height (meters) | Azimuth (0° - 360°) | EMI Meter Reading (dB μ V/m) | In-band? | 15.249 Limit (dB μ V/m) | Margin (dB) |
|-----------------|------------------|------------------|---------------------|----------------------------------|--------------|-----------------------------|-------------|
| 897.9 | H | 1.1 | 90 | 41.0 | Out | 46.0 | 5.0 |
| 910.2 | H | 1.1 | 90 | 45.5 | In | 94.0 | 48.5 |
| 912.04 | H | 1.1 | 90 | 89.3 | In | 94.0 | 4.7 |
| 914.0 | H | 1.1 | 90 | 45.6 | In | 94.0 | 48.4 |
| 926.4 | H | 1.1 | 90 | 38.3 | In | 94.0 | 55.7 |
| 983.2 | H | 1.1 | 270 | 35.4 | Out | 46.0 | 10.6 |
| 1824.0 | H | 1.0 | 45 | 59.3 | Out/harmonic | 63.5 | 4.2 |
| 2736.1 | H | 1.0 | 130 | 58.2 | Out/harmonic | 63.5 | 5.3 |



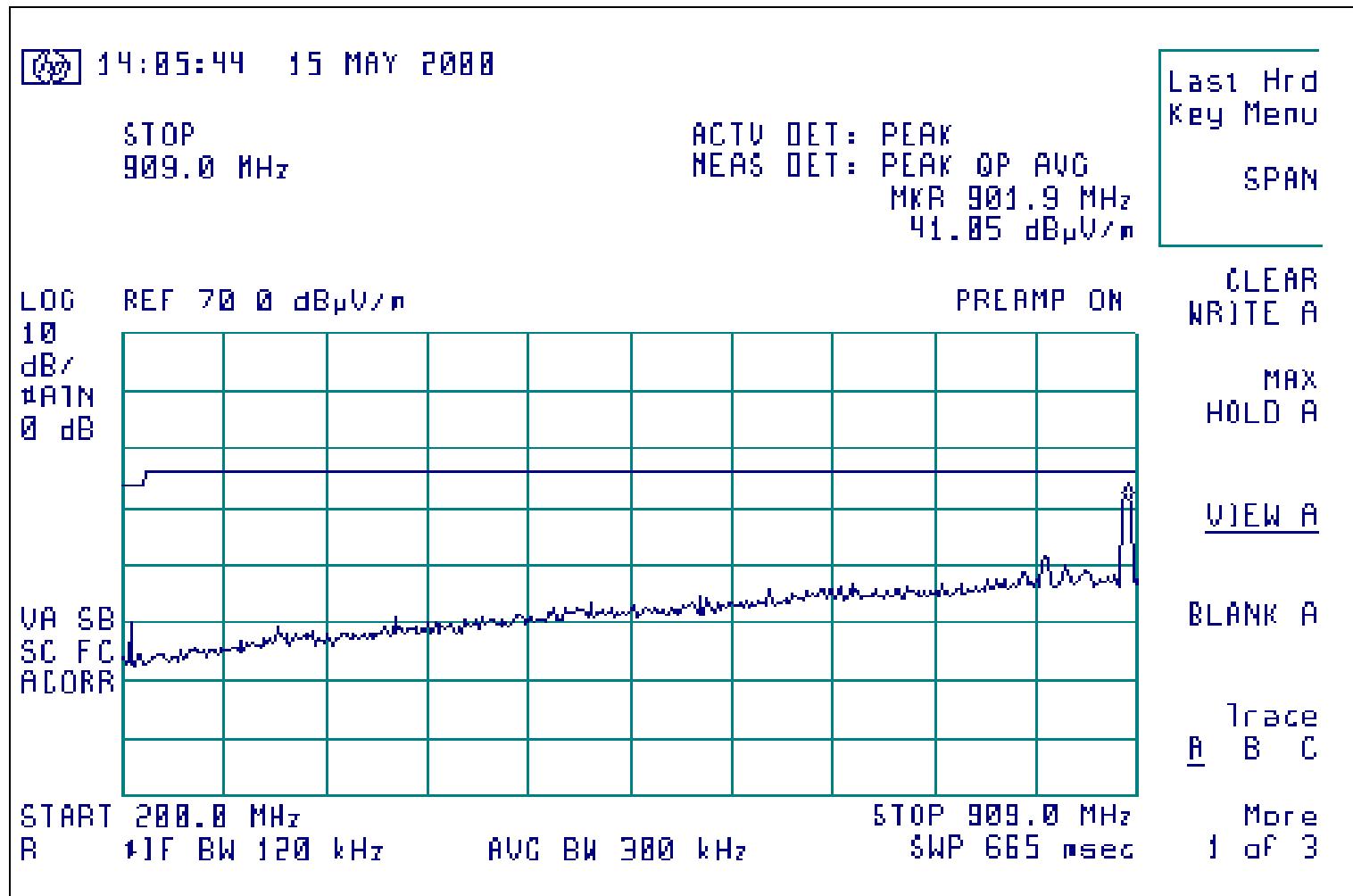
| | | | | | | | |
|--------|---|-----|-----|------|--------------|------|-----|
| 3648.2 | H | 1.0 | 135 | 60.2 | Out/harmonic | 63.5 | 3.3 |
| 4560.1 | H | 1.0 | 310 | 62.4 | Out/harmonic | 63.5 | 1.1 |



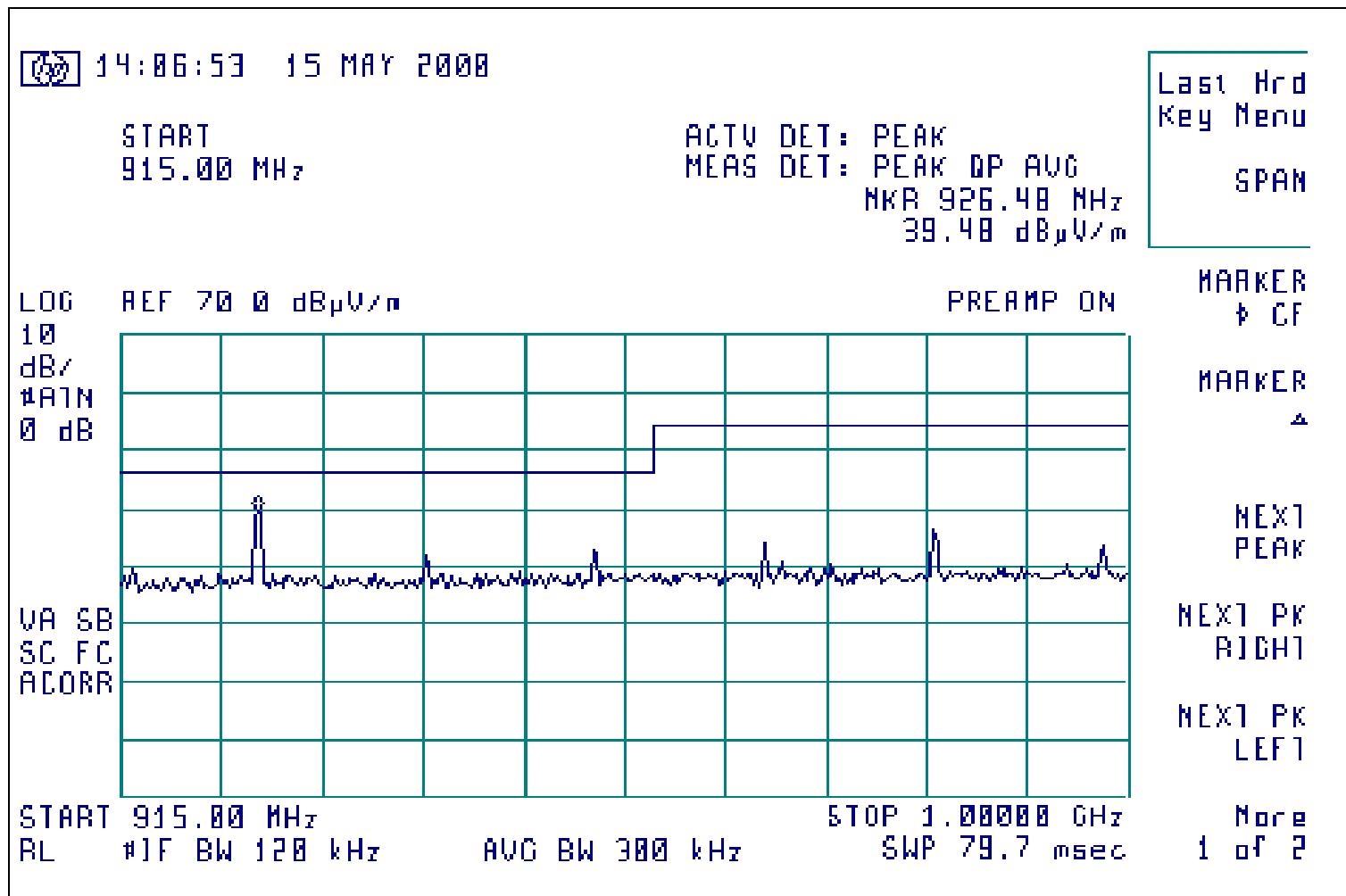
APPENDIX C:

GRAPHS

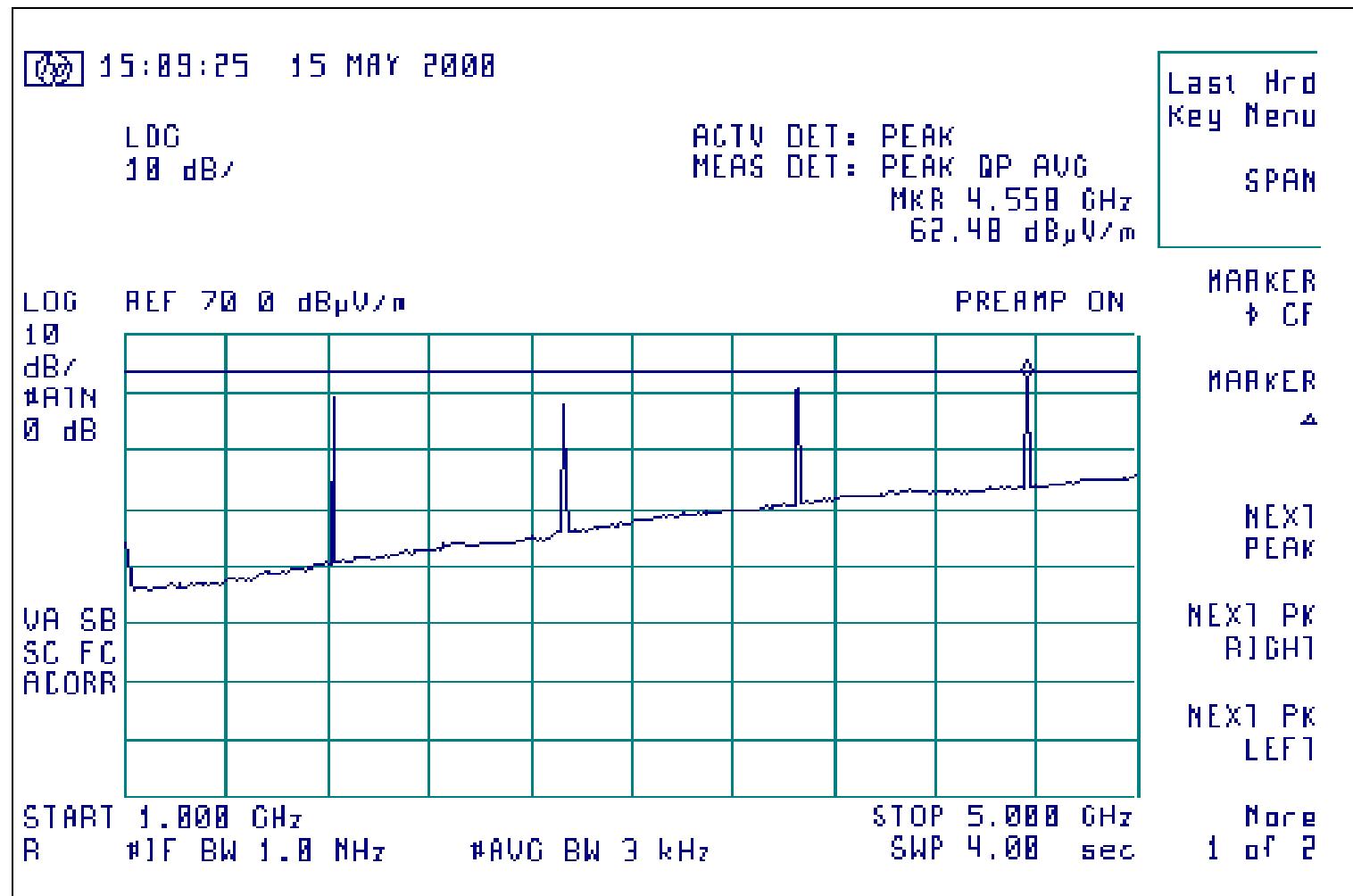
Transmitter, emissions 200 MHz-1 GHz, horizontal polarity



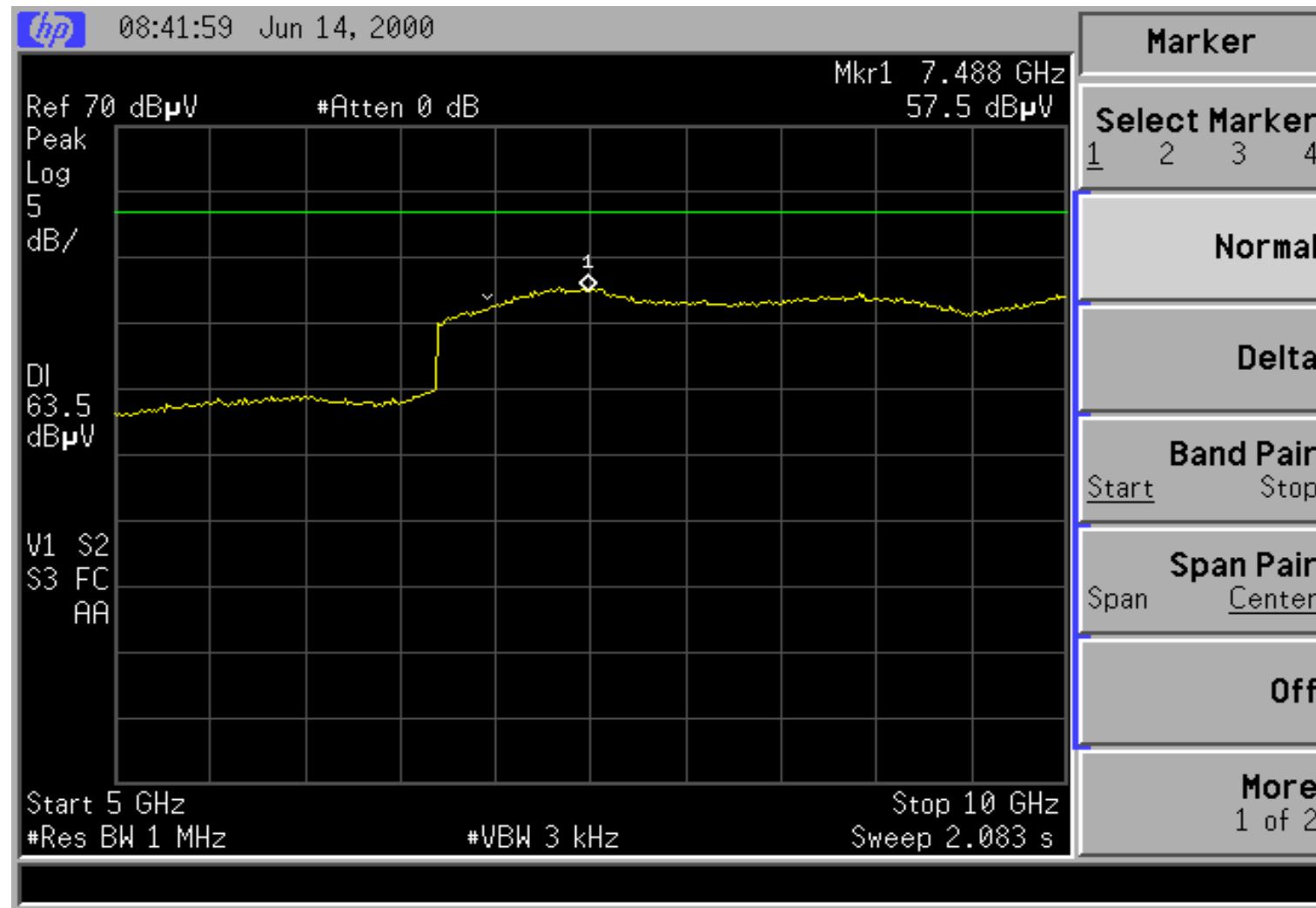
Transmitter, emissions 200-1 GHz, horizontal polarity



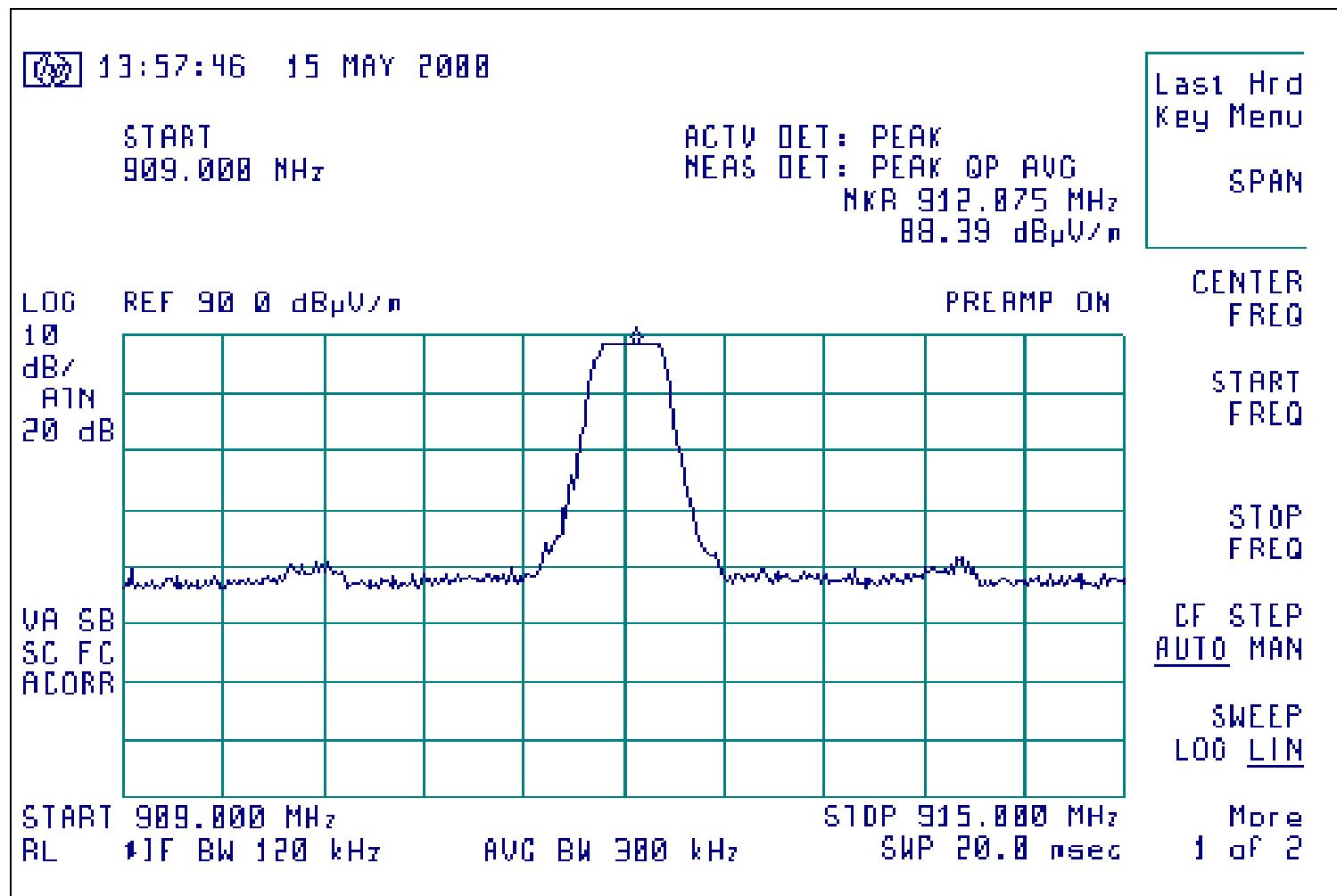
Transmitter, emissions 1-5 GHz, horizontal polarity, sample transmitting carrier



912 MHz Transmitter, emissions 5-10 GHz, horizontal polarity, sample transmitting carrier



912 MHz Transmitter, Fundamental signal, horizontal polarity



912 MHz Transmitter, emissions from 30-200 MHz, horizontal polarity

