***Nemko USA, Inc.***
*11696 Sorrento Valley Rd., Suite F*
*San Diego, CA 92121-1024*
*Phone (858) 755-5525  Fax (858) 452-1810*

| | |
|---|---|
| **Certification Test Report:** | 2007 097241-1 FCC |
| **Project number:** | 7241-1 |
| **Equipment Under Test (EUT):** | Keyfob |
| **Model:** | TST-5223, TST-5224 |
| **FCC ID:**<br>**IC:** | EZSAESTG34<br>1513A-ASTG34 |
| **In Accordance With:** | FCC Part 15 Subpart C, 15.247<br>RSS-210, Issue 7 June 2007 |
| **For:** | Directed Electronics, Inc.<br>One Viper Way<br>Vista, CA 92081<br>USA |
| **Tested By:** | Nemko USA Inc.<br>11696 Sorrento Valley Road, Suite F<br>San Diego, CA 92121 |
| **Authorized By:** | *FR Fleury*<br>FR Fleury, Manager |
| **Date:** | SEPTEMBER 21, 2007 |
| **Total Number of Pages:** | 34 |

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# 2.1.Section 1. Summary of Test Results

**General**

**All measurements are traceable to national standards**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart C and RSS-210, Issue 7 June 2007. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

| | |
|---|---|
| **Apparatus Assessed:** | Keyfob TST-5223, TST-5224 |
| **Specifications:** | FCC Part 15 Subpart C, 15.247<br>RSS-210, Issue 7 June 2007 |
| **Date Received in Laboratory:** | September 21, 2007 |
| **Compliance Status:** | Complies |
| **Exclusions:** | None |
| **Non-compliances:** | None |

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**Report Release History:**

| REVISION | DATE | COMMENTS |
|---|---|---|
| - | September 21, 2007 | Prepared By: Alan Laudani |
| - | September 21, 2007 | Initial Release: F. Fleury |

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY:

Date: September 21, 2007

Alan Laudani, EMC Test Engineer

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# TABLE OF CONTENTS

**11696 Sorrento Valley Road, Suite F, San Diego, CA 92121**
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# Section 2: Equipment Under Test

## 2.1 Product Identification

The EUT is a hand held transmitter used as a remote control for vehicle security/convenience systems. It's comprised of a PCB which has an MCU, Battery, user interface (switches and LED display) and RF circuitry.

When a user activates a command with one of the EUT switches, the command is interpreted by the MCU which generates the data packets to be transmitted and controls the RFIC to generate the hopping sequence for as long as the user presses the button. When there are no buttons pressed, the EUT goes into sleep mode waiting for the next user switch press to wake-up and begin the code hopping transmission again.

The Transmission is achieved via a printed loop antenna on the PCB.
This design employs 25 channels which operate in the 902MHz to 928MHz band. Each channel has a 20dB BW greater than 250KHz but less than 500KHz.

## 2.2 Technical Specifications of the EUT

| | |
|---|---|
| **Manufacturer:** | Directed Electronics, Inc. |
| **Operating Frequency:** | 909.546 to 918.780 MHz in the 902-928 MHz Band |
| **Output Power:** | 98.5 dBuV/m @ 3m; 0.0021 W |
| **Modulation:** | FSK |
| **Antenna Data:** | Integral antenna trace on circuit board |
| **Antenna Connector:** | None |
| **Power Source:** | 3 V battery |

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# Section 3: Test Conditions

## 3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247
Operation within the bands 902-928 MHz, 2400-2483.5 MHz,
5725-5850 MHz and 24.0-24.25 GHz bands.
RSS-210, Issue 7 June 2007
Annex 8: Frequency Hopping and Digital Modulation Systems Operating in the 902—928 MHz … Band

## 3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

## 3.3 Test Environment

All tests were performed under the following environmental conditions:

| | | |
|---|---|---|
| Temperature range | : | 15.6 – 23.3 $^{o}$C |
| Humidity range | : | 26 - 65 % |
| Pressure range | : | 86 - 106 kPa |
| Power supply range | : | +/- 1% of rated voltages |

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## 3.4 Test Equipment

| Nemko ID | Device | Manufacturer | Model | Serial Number | Cal Date | Cal Due Date |
|---|---|---|---|---|---|---|
| 119 | Antenna, Conical Log Spiral | Electro-Metrics | 3101 | 3018 | NCR | Ref. Only |
| 317 | Preamp | HP | 8449A | 2749A00167 | 2/9/2007 | 02/09/08 |
| 535 | Spectrum Analyzer | HP | 85680A | 2517A01757 | 5/11/2007 | 05/11/08 |
| 128 | Antenna | Electro-Metrics | 3104 | 2882 | 11/10/2006 | 11/10/07 |
| 110 | Antenna, LPA | EMCO | 3146 | 1217 | 12/18/2006 | 12/18/07 |
| 674 | Spectrum Analyzer | HP | 8568B | 2007A00910 | 3/13/2007 | 03/13/08 |
| 675 | Spectrum Analyzer Display | HP | 85662A | 2005A01282 | 3/13/2007 | 03/13/08 |
| 676 | Quasi-Peak Adapter | HP | 85650A | 2430A00576 | 3/13/2007 | 03/13/08 |
| 752 | Antenna, DRWG | EMCO | 3115 | 4943 | 10/17/2006 | 10/17/07 |
| 915 | EMI Test Receiver 20 Hz- 26.5 | Rohde & Schwarz | 1088.7490.26 | 837491/0002 | 2/6/2007 | 02/06/08 |
| 920 | Close Field Probe | Agilent | 11940A | 2650A07696 | NCR | REF Only |

OATS: IC Site #: 2040B-1; RN#: 90579

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# Section 4: Observations

## 4.1 Modifications Performed During Assessment

No modifications were performed during assessment.

## 4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

## 4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

## 4.4 Test Deleted

No Tests were deleted from this assessment.

## 4.5 Additional Observations

There were no additional observations made during this assessment.

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# Section 5: Results Summary

This section contains the following:

Test Results

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant
Y Yes: Mandatory i.e. the apparatus shall conform to these test.
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

## 5.1 Test Results

| Part 15 | FCC Test Description | RSS-210 IC Test Description<br>Annex 8: Frequency Hopping and Digital Modulation Systems Operating in the 902—928 MHz Band | Required | Result |
|---|---|---|---|---|
| 15.247 a1i | 20dB Bandwidth | A81(3) The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz. | Y | Pass |
| 12.247a1 | Channel Separation | A81(3) If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10 second period. | Y | Pass |
| 15.247a1i | Number of Hopping Channels | A81(3) | Y | Pass |
| 15.247 b1 | Peak Output Power | A81(2) | Y | Pass |
| 15.209 a<br>15.247c | Radiated Emissions within Restricted Bands | A81(3), A2.9 | Y | Pass |
| 15.247c | Bandedge | A2.9 | Y | Pass |
| 15.109 | Receiver Spurious Emissions | RSS-GEN | NA | Pass |

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# Appendix A: Test Results

## 20 dB Bandwidth

Clause 15.247(a)(1)(i)

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; **if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500kHz.**

### Test Conditions:

| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 74°F |
| **Date:** | 9-21-07 | **Humidity:** | 45% |
| **Modification State:** | Lo/Mid/High Channels | **Tester:** | Alan Laudani |
| | | **Laboratory:** | Nemko |

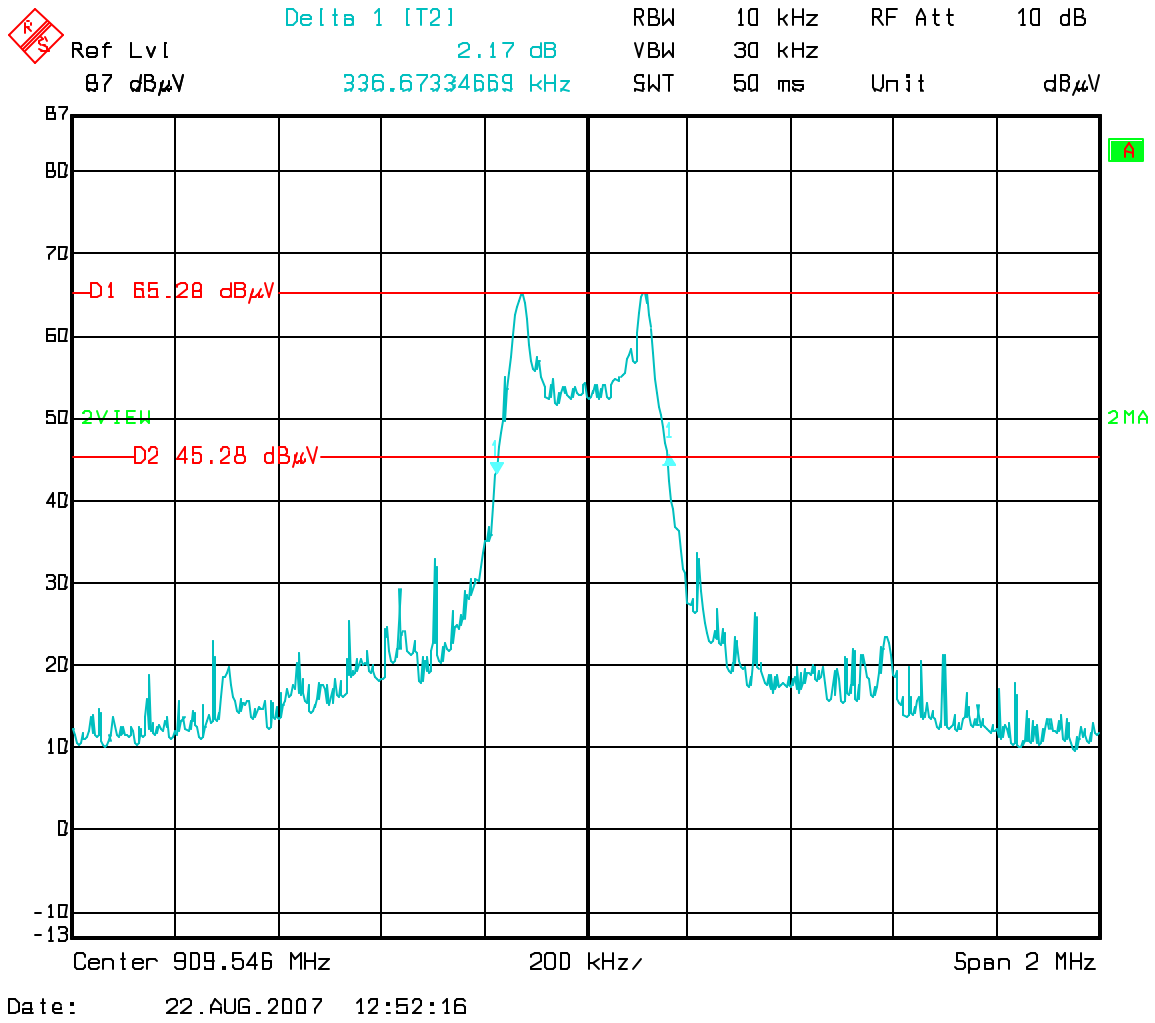
### Test Results:

The EUT was placed <1m from the receiving antenna to allow a representative signal to fill the display > 30dB from the noise floor. The Spectrum Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level. The 20 dB bandwidth was determined from where the channel output spectrum intersected the display line.

| Channel Range | 20dB Bandwidth |
|---|---|
| Low (909.546 MHz) | 336.7 kHz |
| Mid (914.439 MHz) | 296.6 kHz |
| High (918.780 MHz) | 320.6 kHz |

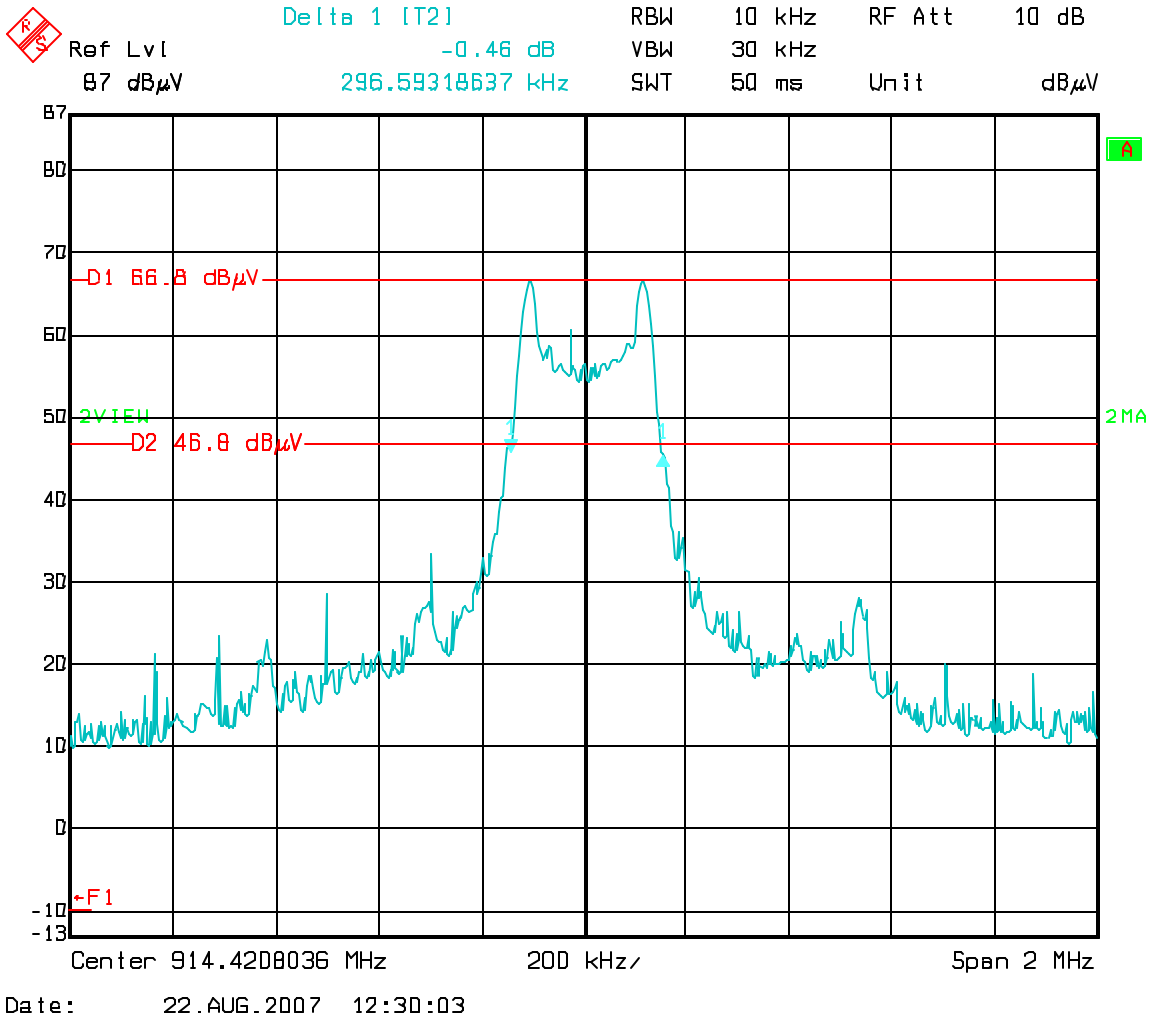
Equipment Used: 119, 835

## Low Channel 909.546 MHz




Date not correct in spectrum analyzer memory.

## Mid Channel 914.439 MHz



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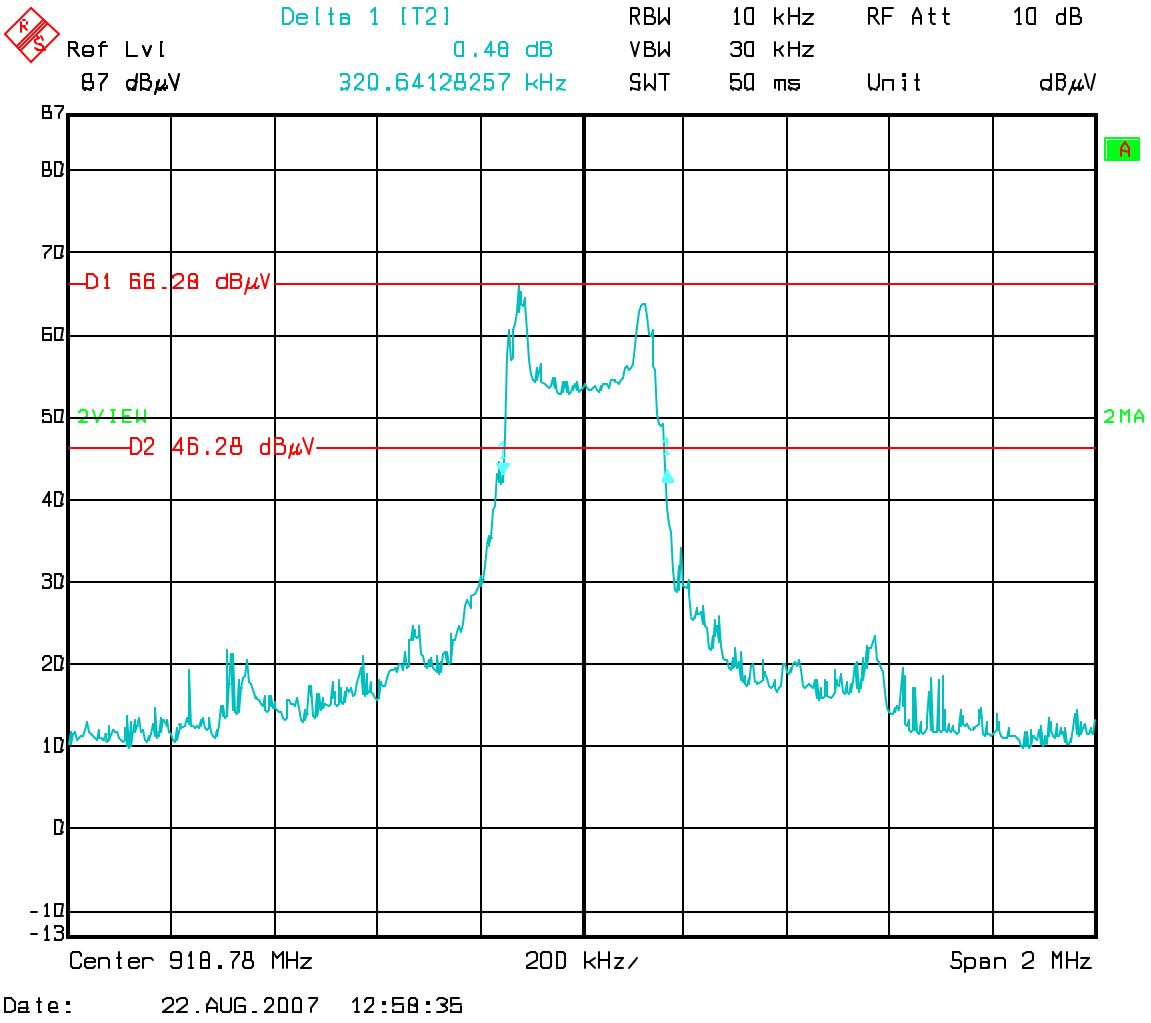
**High Channel 918.780 MHz**



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## Time of Occupancy

Clause 15.247(a)(1)(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, **the system shall use at least 25 hopping frequencies** and **the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.** The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

## Test Conditions:

| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 74°F |
| **Date:** | 9-22-07 | **Humidity:** | 40% |
| **Modification State:** | Hopping | **Tester:** | Alan Laudani |
| | | **Laboratory:** | Nemko |

## Test Results:

The EUT was placed <1m from the receiving antenna to allow a representative signal to fill the display > 30dB from the noise floor. The Spectrum Analyzer RES BW was set to 100 kHz. The test sample was set to hopping mode and the frequency span was set zero. The sweep was set to 10 seconds.

3 occurrences in 10 seconds x 48.1 ms = 144.3 ms which is less than 400 ms
EUT complies.

Duty Cycle Factor Calculation
Since there is an emission for each channel 48 ms in 200 ms and no repeat for 3.7 seconds, one could conclude that a duty cycle exists 48.0 ms per 100 ms or 48.1%. Duty cycle factor is 20 x Log(duty cycle) = 20 x log (.481) = -6.4. Use of a Keyfob transmitter for remote control devices like garage door openers, automobile alarm systems, etc. imply intermittent use over time.

**Equipment Used: 119, 835**

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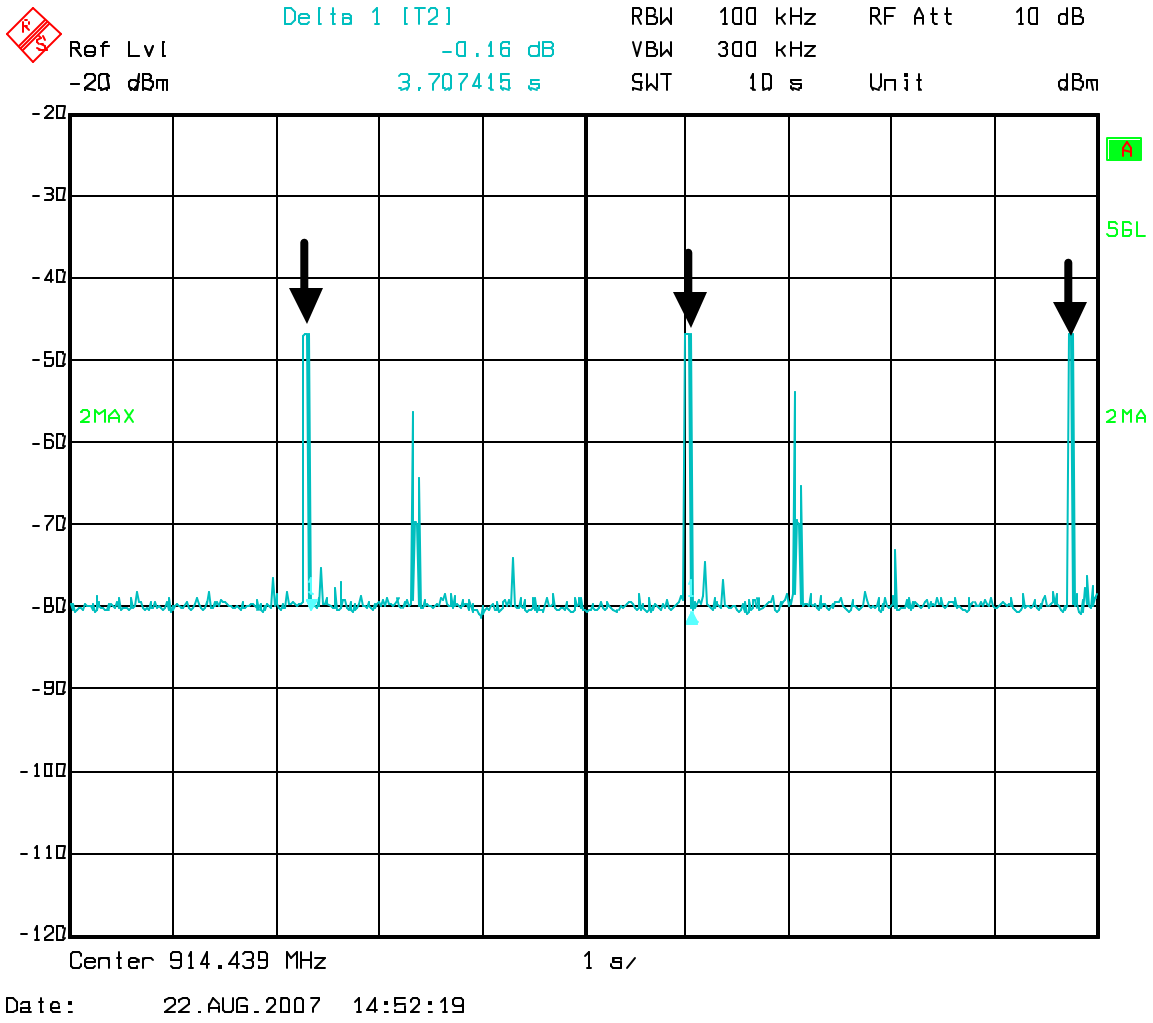
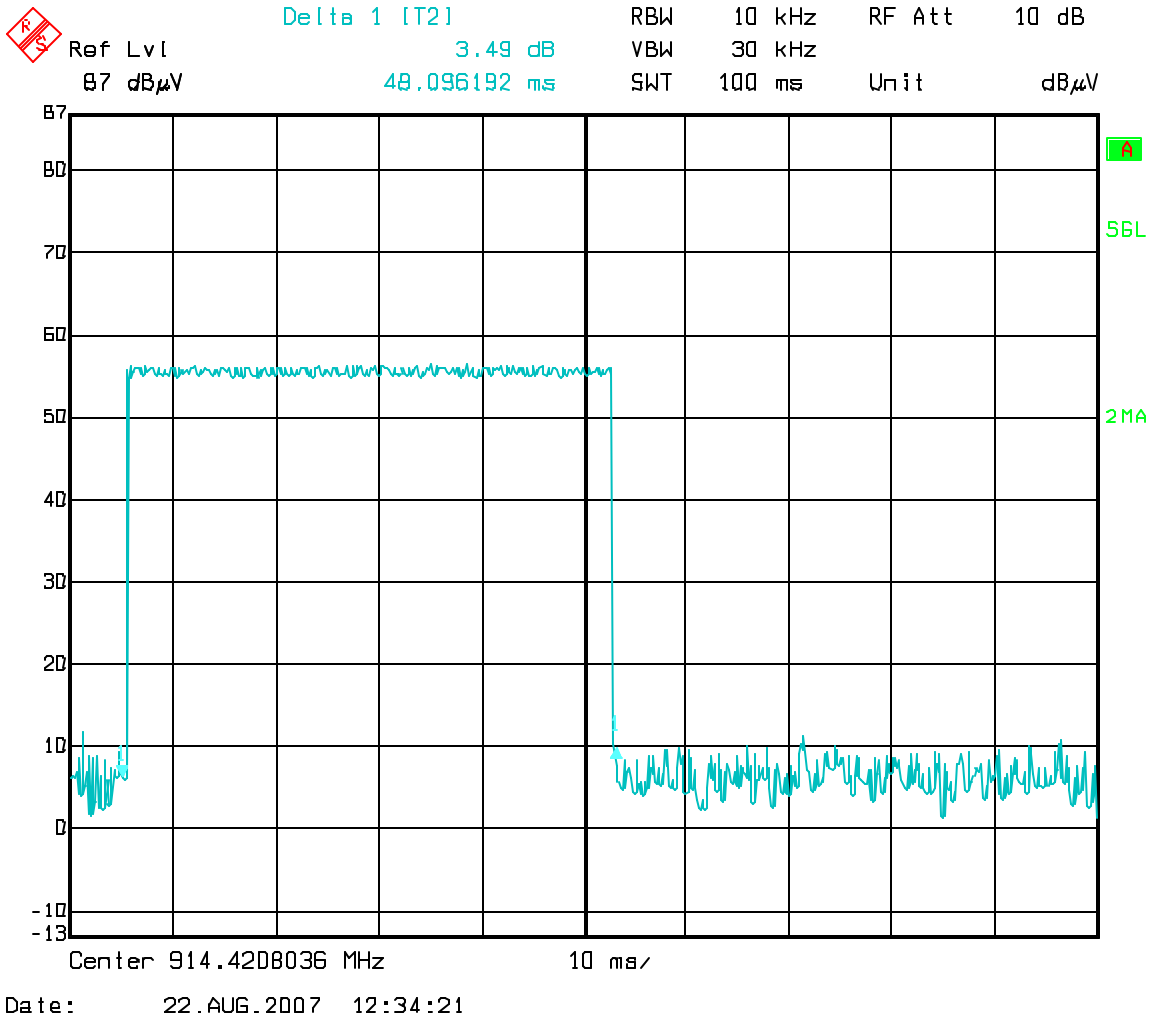
This channel was on three times in 10 seconds 3.7 seconds apart.
Other emissions are reflections of adjacent channels.



This channel was on 48.1 ms.



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## Channel Separation

Clause 15.247(a)(1) **Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.** Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

## Test Conditions:

| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 84°F |
| **Date:** | 9-21-07 | **Humidity:** | 45% |
| **Modification State:** | Lo/Mid/High Channels | **Tester:** | Alan Laudani |
| | | **Laboratory:** | Nemko |

## Test Results:

The EUT was placed <1m from the receiving antenna to allow a representative signal to fill the display > 30dB from the noise floor. The Spectrum Analyzer RES BW was set to 10 kHz. The test sample was set to hopping mode and the frequency span was set to a value to capture two or more hopping channels. Marker delta shows frequency separation.

**Equipment Used: 119, 835**

**11696 Sorrento Valley Road, Suite F, San Diego, CA 92121**
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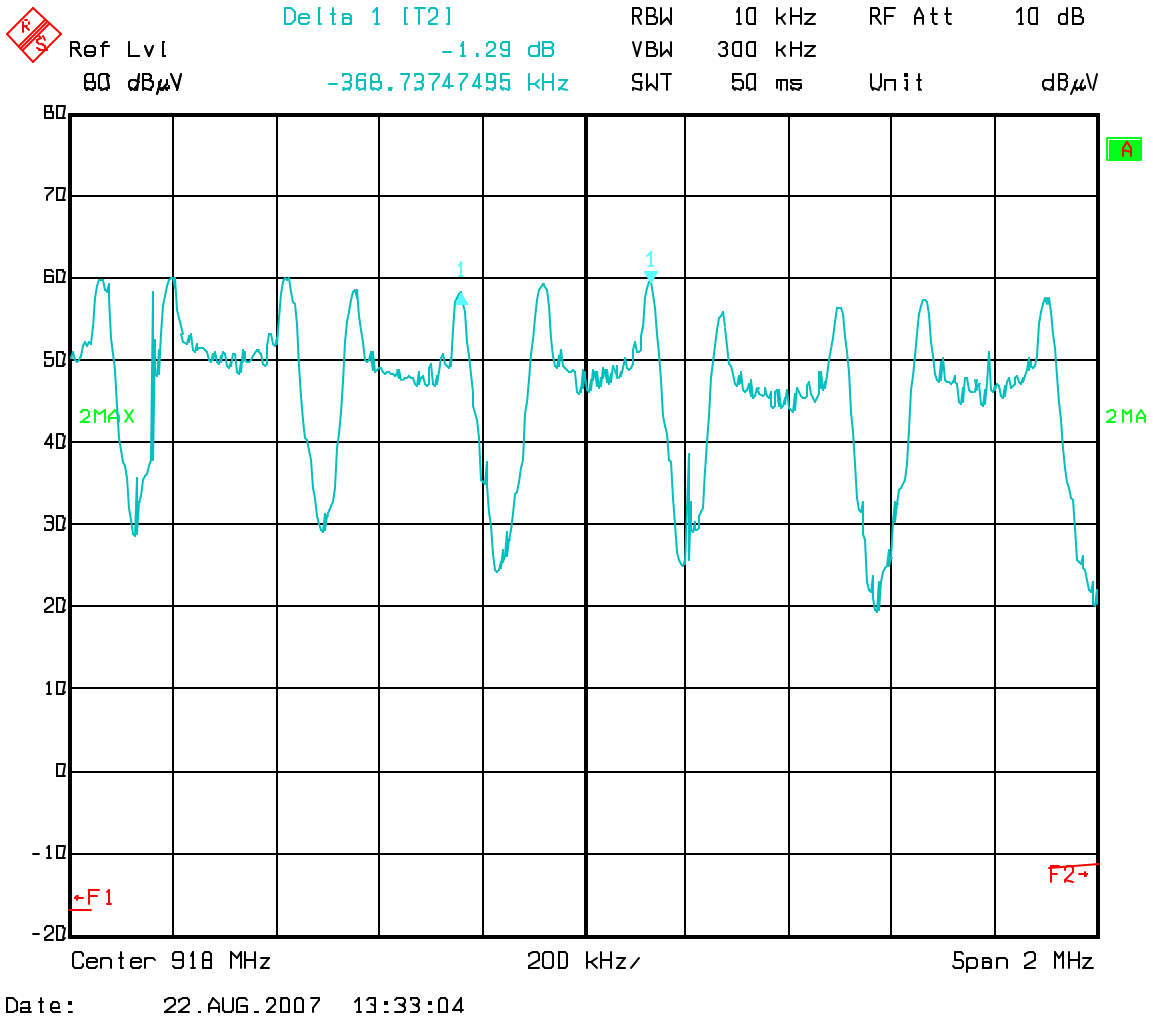
Channel Separation equal to the 20 dB bandwidth.
368 kHz



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## Frequency Plan

Clause 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. **The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.**

## Test Conditions:

| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 74°F |
| **Date:** | 9-21-07 | **Humidity:** | 40% |
| **Modification State:** | Lo/Mid/High Channels | **Tester:** | Alan Laudani |
| | | **Laboratory:** | Nemko |

## Test Results:

The Frequency Plan is discussed in the Technical Description exhibit and was reviewed by this test engineer and was found to comply.

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**Phone (858) 755-5525 Fax (858) 452-1810**



## Number of Hopping Channels

Clause 15.247(a)(1)(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, **the system shall use at least 25 hopping frequencies** and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

## Test Conditions:

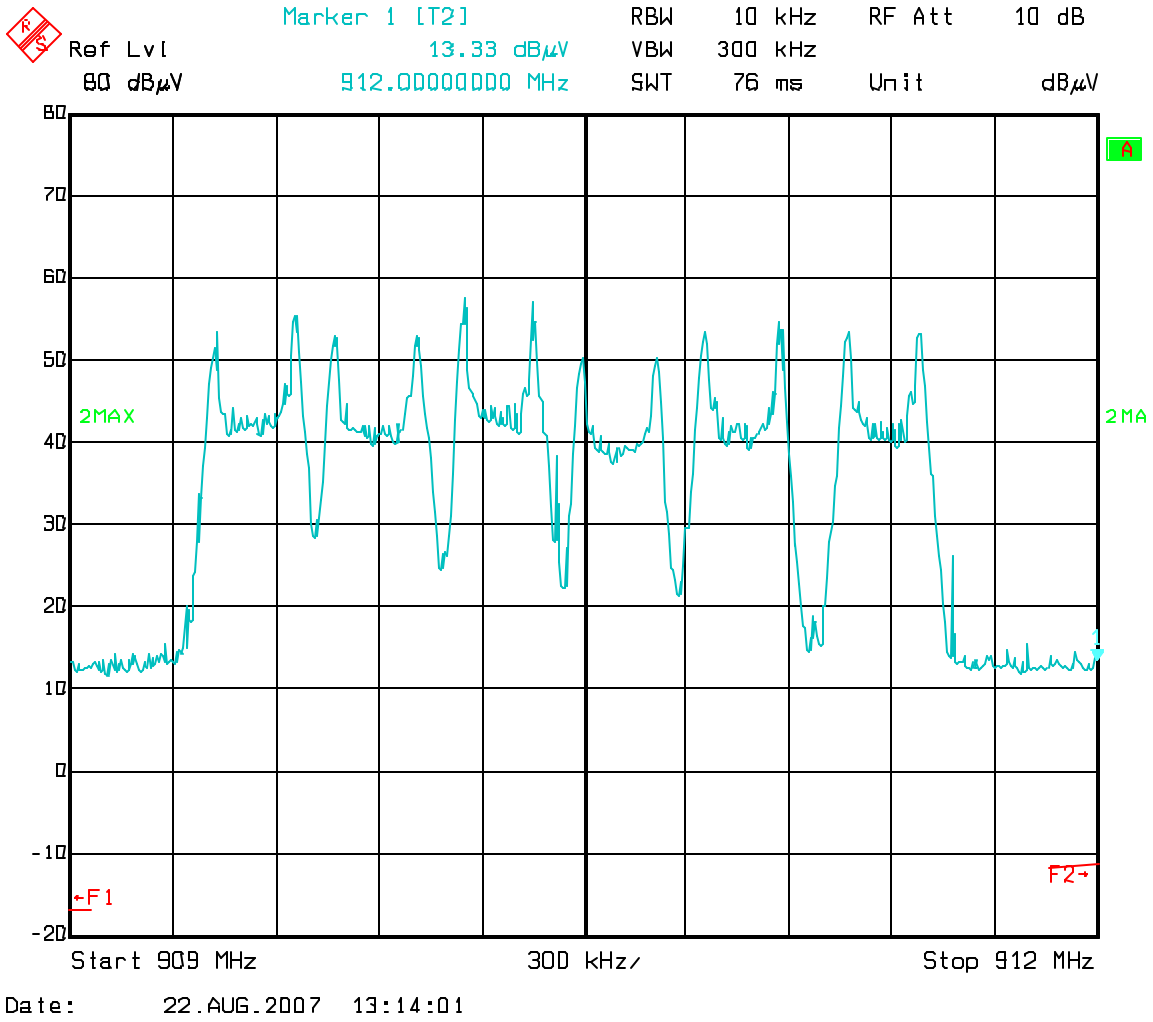
| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 84°F |
| **Date:** | 9-21-07 | **Humidity:** | 40% |
| **Modification State:** | Lo/Mid/High Channels | **Tester:** | Alan Laudani |
| | | **Laboratory:** | Nemko |

## Test Results:

The EUT was placed <1m from the receiving antenna to allow a representative signal to fill the display > 30dB from the noise floor. The Spectrum Analyzer RES BW was set to 30 kHz to discriminate channels. The test sample was set to hopping mode and the frequency span was set to a value small enough to display the channels to allow counting. Three continuous scans shows the complete band from 902 MHz to 920 MHz and 25 channels are evident.

Equipment Used: 119, 835

6 Hopping channels



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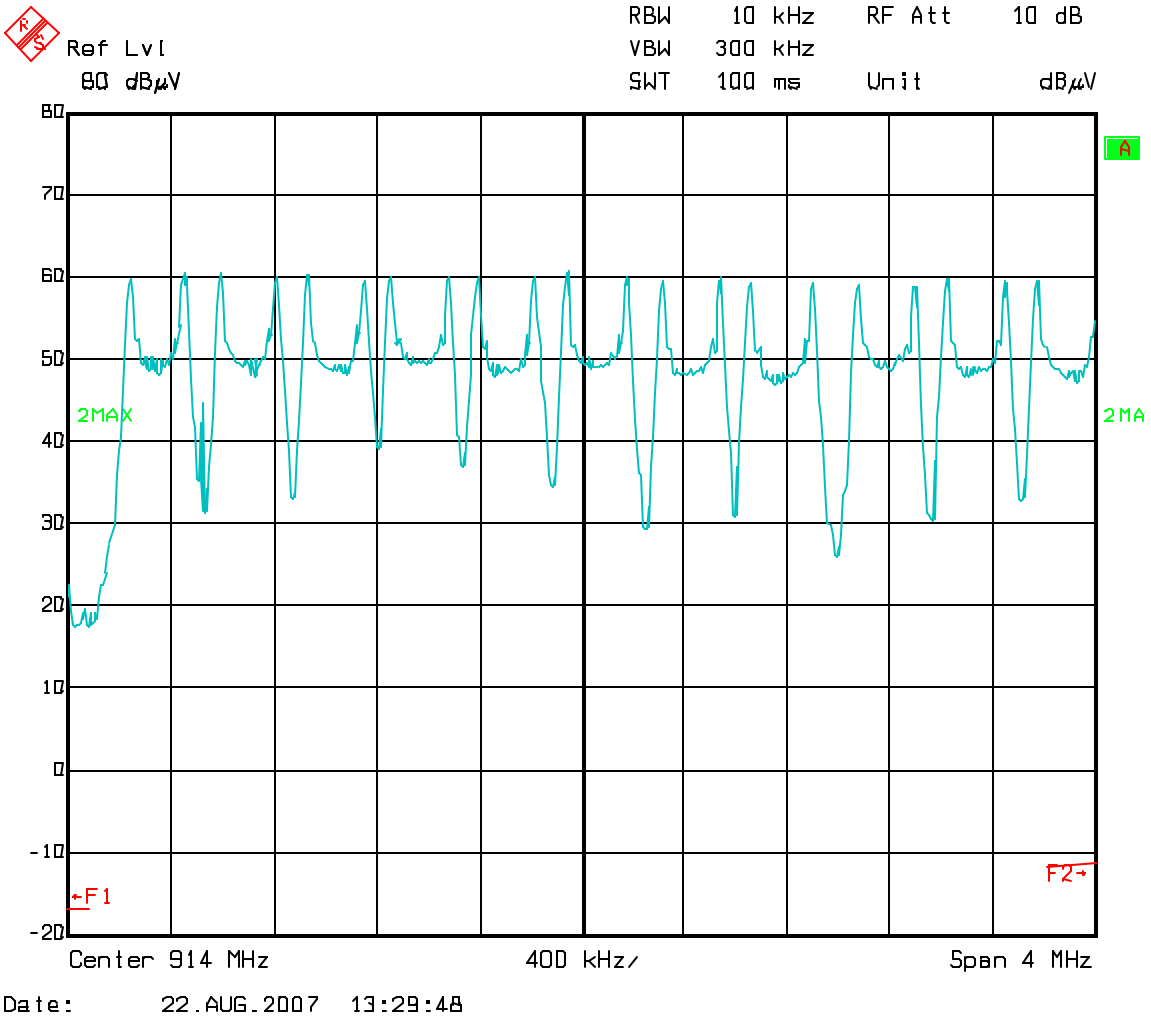
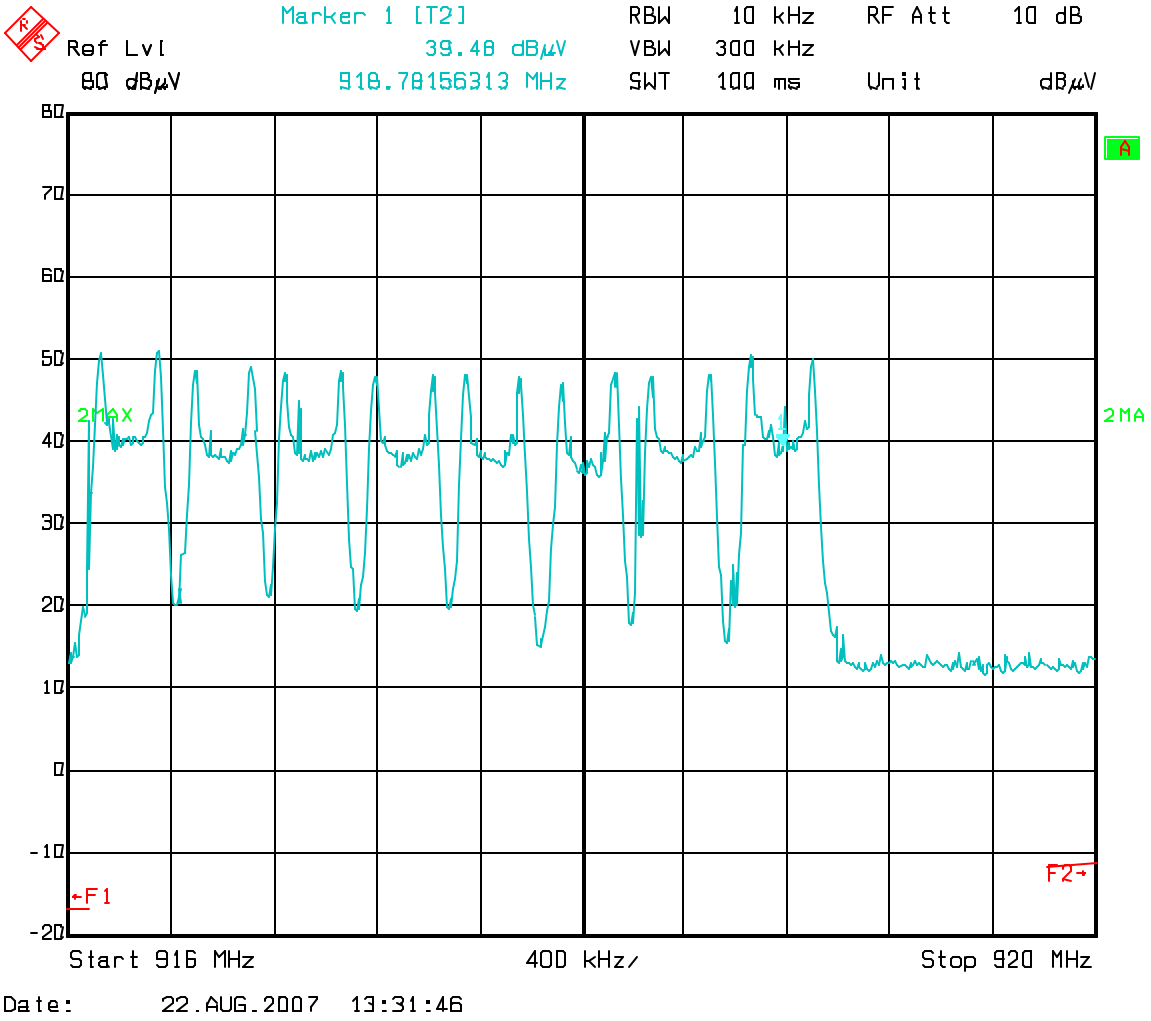
11 Hopping channels
Break in continuity between 6th and 7th as planned.



8 Hopping channels
6 + 11 + 8 = 25



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**Phone (858) 755-5525 Fax (858) 452-1810**


## Radiated Emissions within Restricted Bands

Clause 15.209(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (uV/meter) | Measurement Distance (meter) |
|---|---|---|
| 0.009-0.490 | 2400/F (kHz) | 300 |
| 0.490-1.705 | 24000/F (kHz) | 30 |
| 1.705-30.0 | 30 | 3 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a) must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

## Test Conditions:

| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 84.0°F |
| **Date:** | 9-21-07 | **Humidity:** | 45 % |
| **Modification State:** | Lo/Mid/High Channels | **Tester:** | A. Laudani |
| | | **Laboratory:** | SOATS |

## Test Results:

See Table Below.

## Additional Observations:

The Spectrum was searched from 30 MHz to the 10th Harmonic.
Three orthogonal axes were tried to maximize emissions. Worst case was used in measurements presented. A new battery was installed initially and replaced every 20 minutes of test time.
There are no emissions found that apply to the restricted bands defined in FCC Part 15 Subpart C, 15.205. The EUT was measured on three orthogonal axes. Worst case measured with antenna horizontal and vertical. Spurious Measurements below 1 GHz were performed at 3m with a Quasi-Peak detector while Peak and Average detectors were used above 1GHz.
As the emission is pulsing, a duty cycle factor was introduced to spurious harmonics. See calculation in section on Time of Occupancy.

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## Radiated Emissions 30 MHz to 1000 MHz

No emissions found within 20 dB of the limits of Part 15, Subpart C 15.209 and 15.205.
Equipment used 110, 128, 674, 675, 676 in a 1m prescan in an enclosed shielded room.

Math: Corrected Reading =
Max of Vertical or Horizontal measured + Antenna Factor + Cable Loss – preamplifier (if used). – Duty Cycle Factor

CR/SL Dif = Limit – Corrected Reading. Pass if result is negative.

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## Radiated Emissions: Output Power and Spurious to 10th Harmonic

Math: Corrected Reading =
Max of Vertical or Horizontal measured + Antenna Factor + Cable Loss – preamplifier (if used). – Duty Cycle Factor

CR/SL Dif = Limit – Corrected Reading. Pass if result is negative.

At 1819 MHz: 42.2 = 51.6 + 25.6 + 4.9 – 33.5 –6.4; 42.2 – 54 = -11.8

## OATS: IC Site #: 2040B-1; RN#: 90579

**Radiated Emissions Data**

| | | | | | |
|---|---|---|---|---|---|
| Job # : | 7241-1 | Date : | 9-21-07 | Page 1 of 1 | |
| NEX #: | 93496 | Time : | 10 am | | |
| | | Staff : | AAL | | |
| Client Name : | Directed Electronics, INC. | | | EUT Voltage : | 3Vdc |
| EUT Name : | Keyfob | | | EUT Frequency : | na |
| EUT Model # : | TST-5224 | | | Phase: | 1 |
| EUT Serial # : | NA | | | NOATS | |
| EUT Config. : | Non-Hopping Test Mode | | | SOATS | X |
| | | | | Distance: | 3m |
| Specification : | CFR47 Part 15, Subpart B, Class B | | | | |
| Loop Ant. #: | NA | | | | |
| Bicon Ant.#: | NA | Temp. (°C) : | 21 | | |
| Log Ant.#: | 110 | Humidity (%) : | 36 | | |
| DRG Ant. # | 752 | Spec An.#: | 835 | | |
| Dipole Ant.#: | NA | Spec An. Display #: | 835 | | |
| Cable LF#: | SOATS | QP #: | NA | | |
| Cable HF#: | 40Ft | PreSelect#: | NA | | |
| Preamp LF#: | NA | Duty Cycle Factor: | -6.4 | | |
| Preamp HF# | 317 | | | | |

| | |
|---|---|
| Quasi-Peak | RBW: 120 kHz |
| | Video Bandwidth 300 kHz |
| Peak | RBW: 1 MHz |
| | Video Bandwidth 3 MHz |
| Average | RBW: 1 MHz |
| | Video Bandwidth 10 Hz |

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

| Meas. Freq. (MHz) | Meter Reading **Vertical** | Meter Reading **Horizontal** | Det. | EUT Side F/L/R/B | Ant. Height m | Max. Reading (dBuV) | Corrected Reading (dBuV/m) | Spec. limit (dBuV/m) | CR/SL Diff. (dB) | Pass Fail | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 909.546 | 66.3 | 72.2 | P | | 1.6 | 72.2 | 98.5 | 119.2 | -20.7 | Pass | |
| 1819.092 | 50.6 | 51.6 | P | | 1.3 | 51.6 | 48.5 | 74.0 | -25.4 | Pass | |
| 1819.092 | | | A | | | | 42.2 | 54.0 | -11.8 | Pass | |
| 2728.638 | 51.6 | 51.0 | P | | 1.3 | 51.6 | 52.5 | 74.0 | -21.5 | Pass | |
| 2728.638 | | | A | | | | 46.2 | 54.0 | -7.8 | Pass | |
| 3638.184 | 51.3 | 50.7 | P | | 1.3 | 51.3 | 54.1 | 74.0 | -19.8 | Pass | |
| 3638.184 | | | A | | | | 47.8 | 54.0 | -6.2 | Pass | |
| 914.439 | 65.7 | 71.4 | P | | 1.6 | 71.4 | 98.3 | 119.2 | -20.9 | Pass | |
| 1828.878 | 52.8 | 53.5 | P | | 1.0 | 53.5 | 50.4 | 74.0 | -23.5 | Pass | |
| 1828.878 | | | A | | | | 44.1 | 54.0 | -9.9 | Pass | |
| 2743.317 | 53.3 | 53.4 | P | | 1.1 | 53.4 | 54.3 | 74.0 | -19.7 | Pass | |
| 2743.317 | | | A | | | | 48.0 | 54.0 | -6.0 | Pass | |
| 3657.756 | 46.1 | 44.7 | P | | 1.0 | 46.1 | 48.9 | 74.0 | -25.0 | Pass | |
| 3657.756 | | | A | | | | 42.6 | 54.0 | -11.4 | Pass | |
| 918.780 | 63.4 | 70.2 | P | | 1.6 | 70.2 | 97.1 | 119.2 | -22.1 | Pass | |
| 1837.560 | 54.0 | 52.6 | P | | 1.0 | 54 | 50.9 | 74.0 | -23.0 | Pass | |
| 1837.560 | | | A | | | | 44.6 | 54.0 | -9.4 | Pass | |
| 2756.340 | 53.7 | 53.0 | P | | 1.0 | 53.7 | 54.6 | 74.0 | -19.4 | Pass | |
| 2756.340 | | | A | | | | 48.3 | 54.0 | -5.7 | Pass | |
| 3675.120 | 46.9 | 36.8 | P | | 1.0 | 46.9 | 49.7 | 74.0 | -24.2 | Pass | noise floor |
| 3675.120 | | | A | | | | 43.4 | 54.0 | -10.6 | Pass | |

## Bandedge Measurements

### Test Conditions:

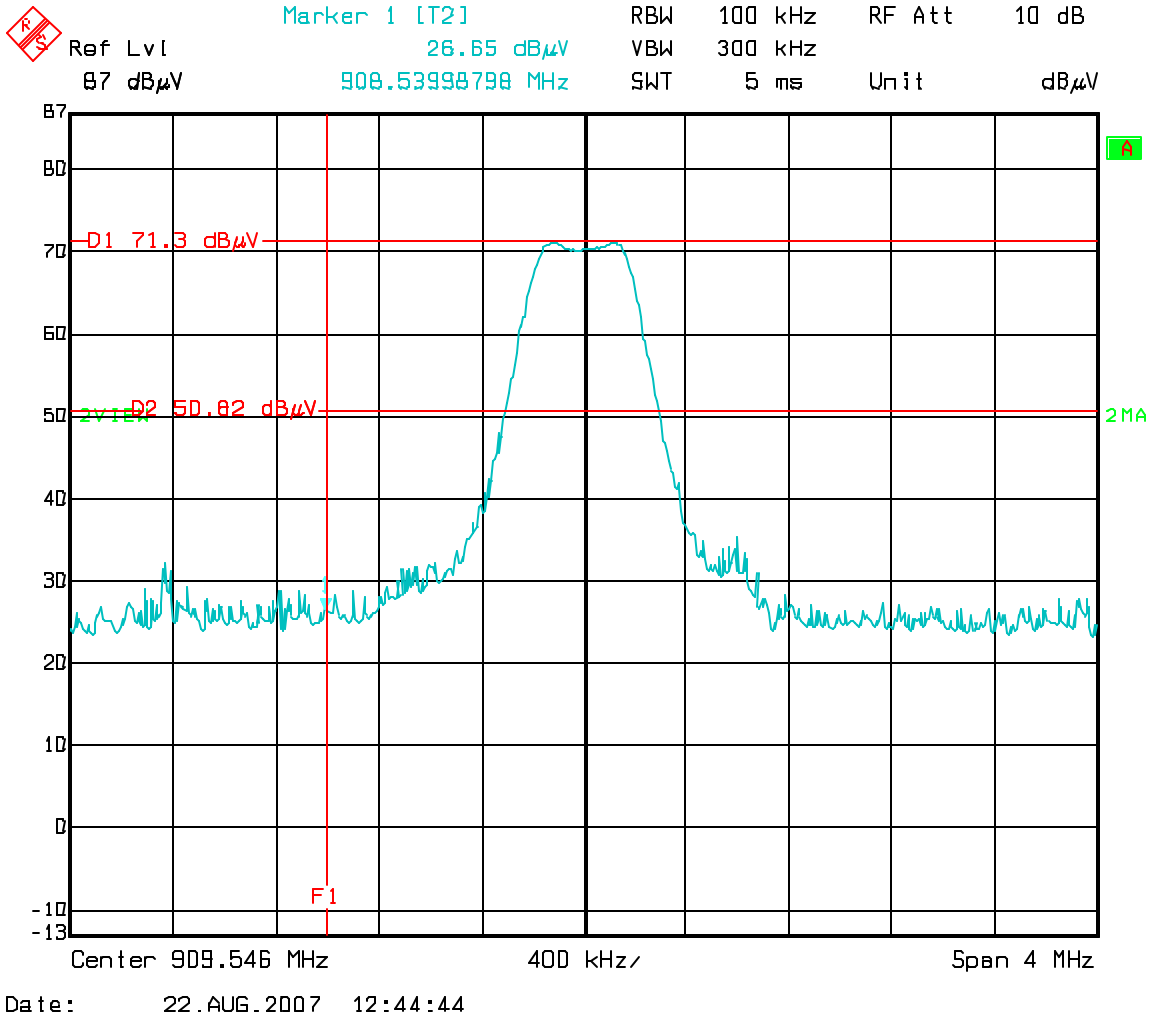
| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 84°F |
| **Date:** | Sept. 21, 2007 | **Humidity:** | 45% |
| **Modification State:** | Lo/Mid/High Channels | **Tester:** | Alan Laudani |
| | | **Laboratory:** | Nemko |

### Test Results:

3m site SOATS, equipment used: 835, 110, Peak hold three sweeps and view.

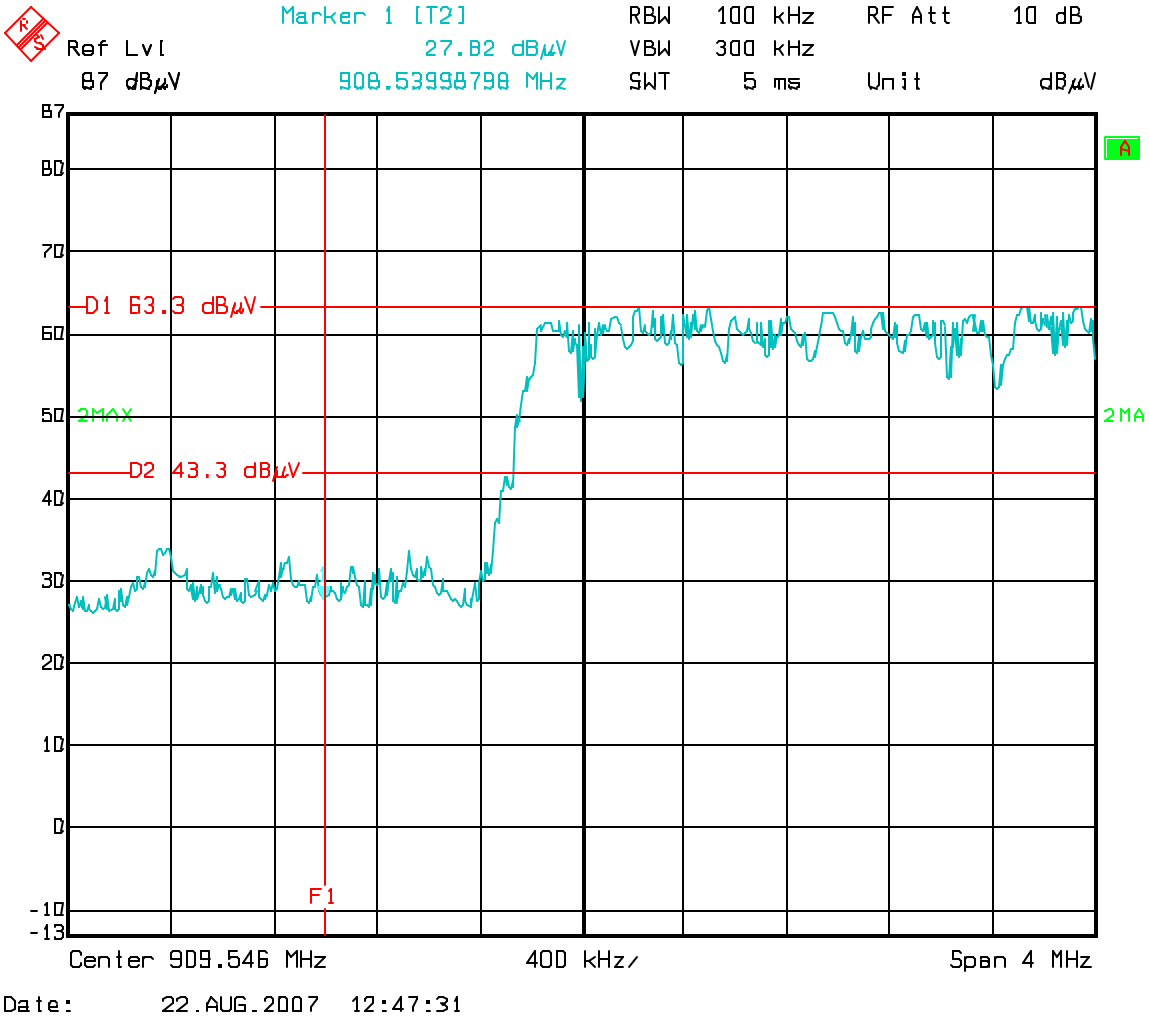
**Low Channel Not Hopping Mode**

**Frequency Line F1 is 902 MHz**
**Display Line D2 is 20 dBc**



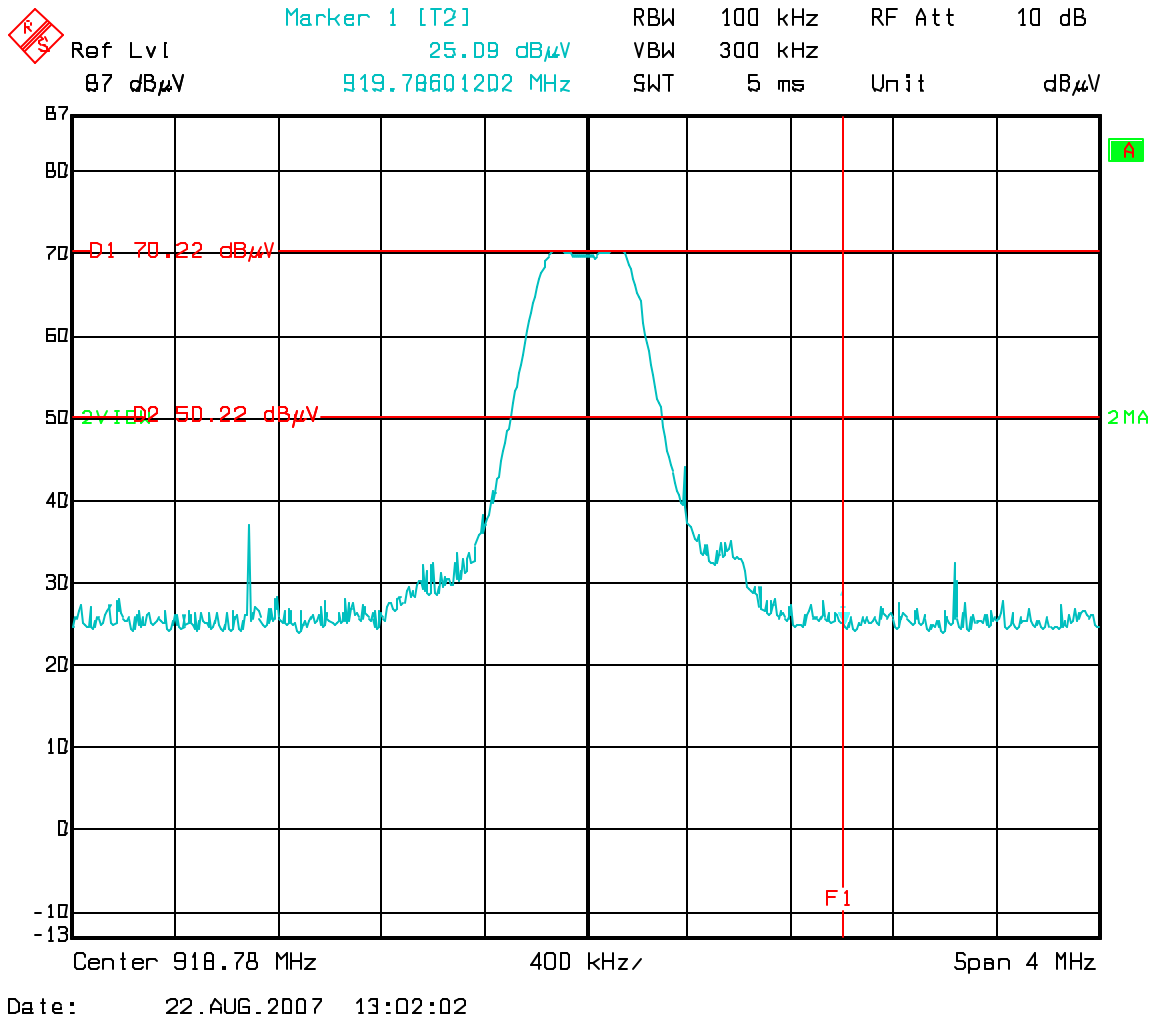
## Low Channel Hopping Mode

## Frequency Line F1 is 902 MHz
## Display Line D2 is 20 dBc



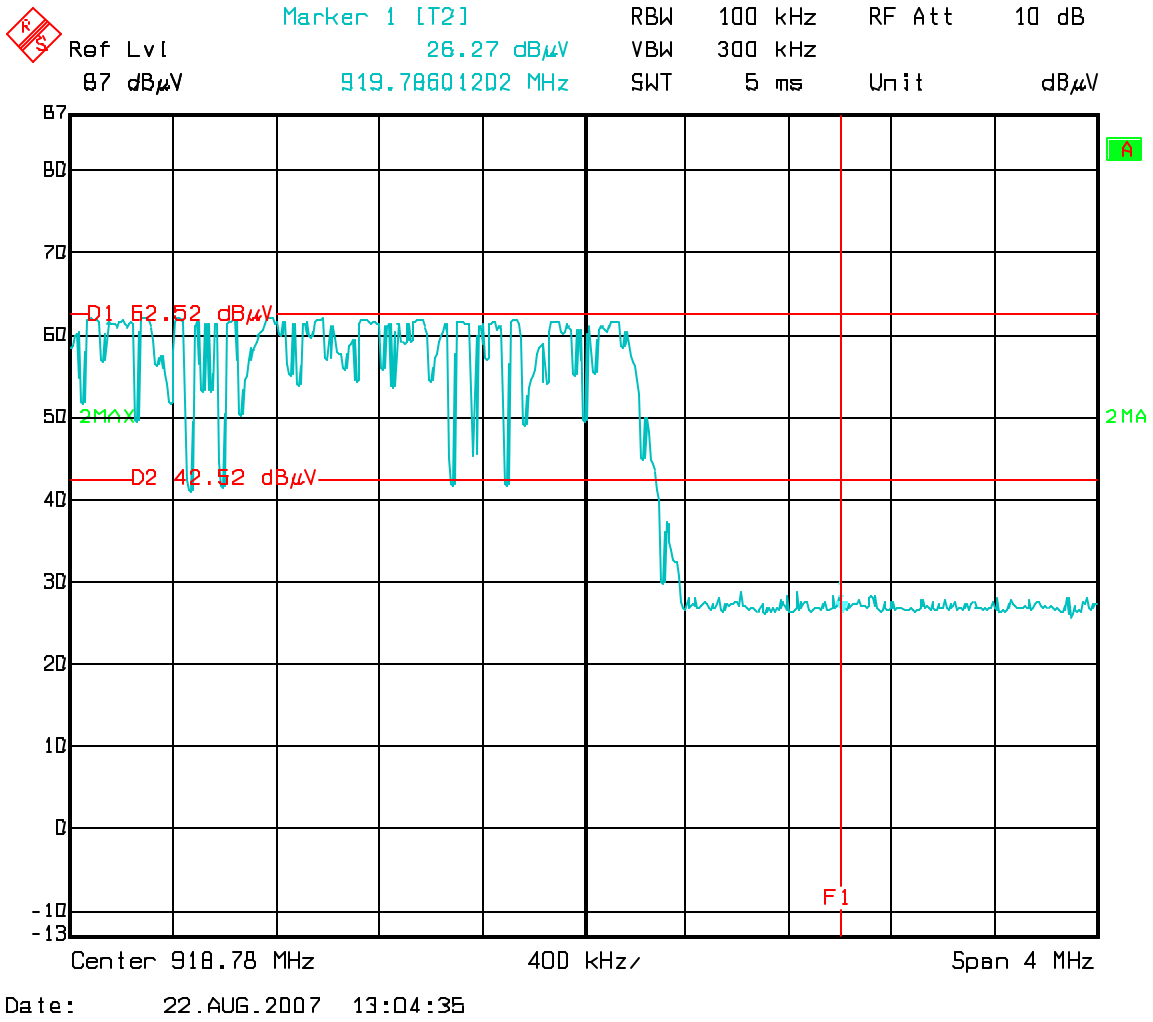
## High Channel Not Hopping Mode

## Frequency Line F1 is 928 MHz
## Display Line D2 is 20 dBc



## High Channel Hopping Mode

### Frequency Line F1 is 928 MHz
### Display Line D2 is 20 dBc



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## Peak Output Power

Clause 15.247(b)(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, **0.25 watts for systems employing less than 50 hopping channels**, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

## Test Conditions:

| | | | |
|---|---|---|---|
| **Sample Number:** | TST-5224 | **Temperature:** | 84°F |
| **Date:** | Sept. 21, 2007 | **Humidity:** | 45% |
| **Modification State:** | Lo/Mid/High Channels | **Tester:** | Alan Laudani |
| | | **Laboratory:** | Nemko |

## Test Results:

Limit = 0.25 W
The equivalent power of the field strength is 2.1 mW therefore the EUT complies.

## Radiated Peak Output Power:

| Channel | Frequency | Corrected Field Strength dBuV/m | Calculated Output Power (W) |
|---|---|---|---|
| Low | 909.546 MHz | 98.5 | 0.0021 |
| Mid | 914.439 MHz | 98.3 | 0.0020 |
| High | 918.780 MHz | 97.1 | 0.0015 |

10^((dBuV/m-120)/20) = Volts/m
Field Strength in Volts/m = 5.5 x Square Root (Power in W)/3m
Power in Watts = (Field Strength x 3/5.5)^2

98.5 dBuV/m = 0.0841 V/m
Field Strength of 0.0841 V/m = 0.0021 W.

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## 2.1. Appendix B: Setup Photographs

### Radiated Emissions Setup:

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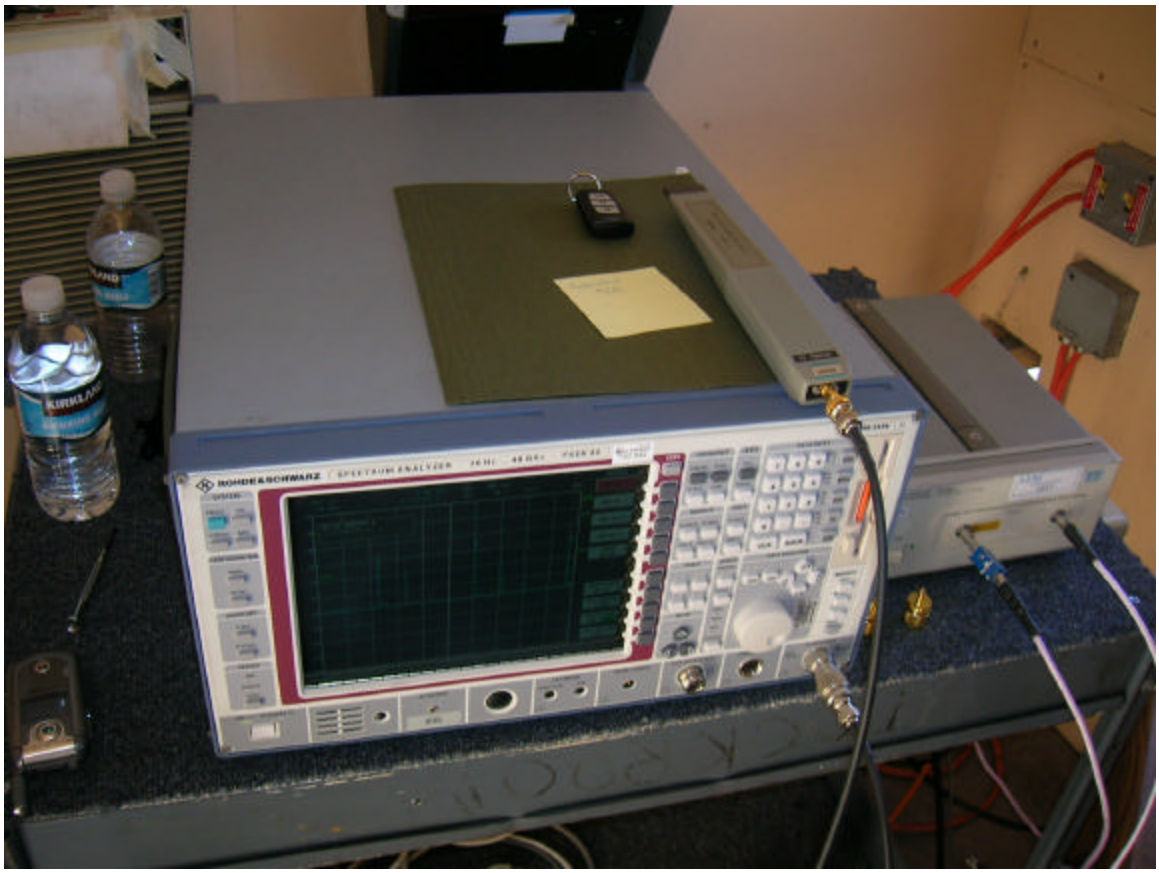
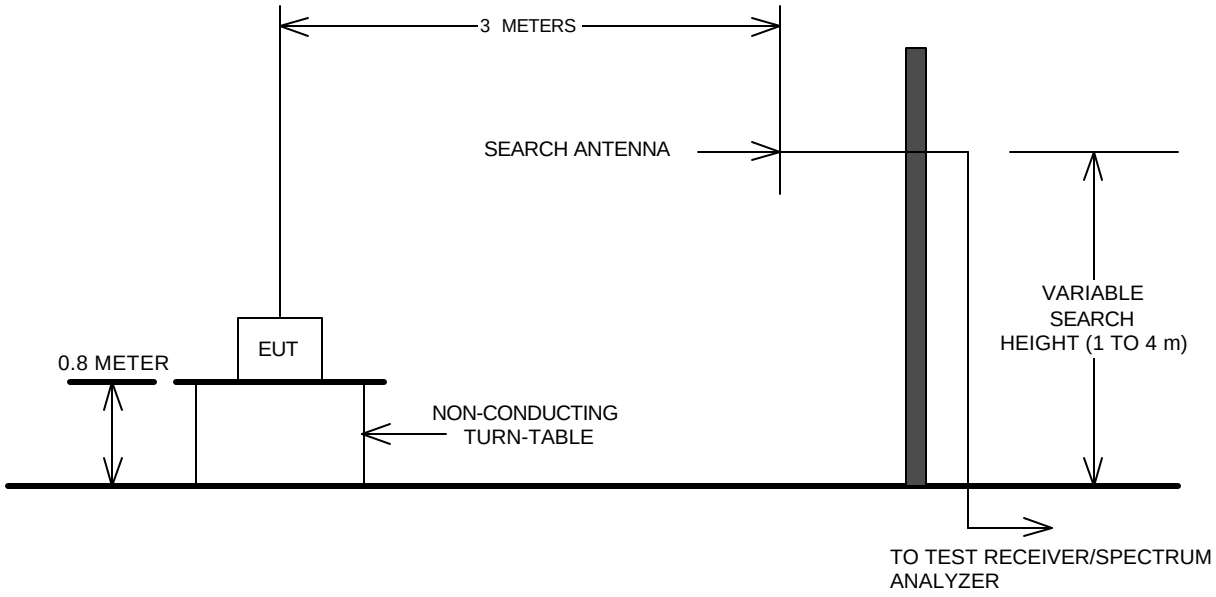
## Relative Emissions Setup:

Number of Hopping Frequencies, Channel Separation, ETC. where the actual amplitude is not measured.



## 2.2 Appendix C: Block Diagram of Test Setups

### Test Site For Radiated Emissions




### Conducted Emissions

Not tested as no connection can be made to the device.