

# **TIMCO ENGINEERING INC.**

849 NW State Road 45  
Newberry, Florida 32669  
<http://www.timcoengr.com>  
888.472.2424 F 352.472.2030 email: [sid@timcoengr.com](mailto:sid@timcoengr.com)



## Test Report

Product Name: WIRELESS LAN

FCC ID: JFE-D2D00003

Applicant:

**PARKERVISION INC.  
8493 BAYMEADOWS WAY  
JACKSONVILLE, FL 32256**

**Date Receipt: FEBRUARY 26, 2004**

**Date Tested: MARCH 2, 2004**

APPLICANT: PARKERVISION INC.  
FCC ID: JFE-D2D00003  
REPORT #: P\PARKERJFE\236AUT4\236AUT4TestReport.doc

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### EXHIBITS INCLUDED:

REQUEST FOR CONFIDENTIALITY LETTER  
BLOCK DIAGRAM  
SCHEMATICS  
USERS MANUAL  
LABEL SAMPLE  
LABEL LOCATION  
EXTERNAL PHOTOGRAPHS  
INTERNAL PHOTOGRAPHS  
OPERATIONAL DESCRIPTION  
TEST SET UP PHOTOGRAPHS

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MARCH 2, 2004

Federal Communications Commission  
Authorization and Evaluation Division  
7435 Oakland Mills Road  
Columbia, MD 21046

SUBJECT: PARKERVISION INC.

FCC ID: JFE-D2D00003

To Whom It May Concern:

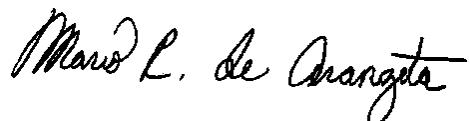
The attached application is for a direct sequence spread spectrum wireless router.

This system has only one type of antenna, permanently attached dipoles with a gain of 2dBi.

PARKERVISION INC. purchases standard antennas from the manufacturer.

Should you have any questions or require any further information with regards to this, please feel free to contact me.

Sincerely,



Mario R. de Aranzeta C.E.T.

MRD/sh  
Encl.

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## EMC Equipment List

| Device                          | Manufacturer    | Model         | Serial Number            | Cal/Char Date  | Due Date |
|---------------------------------|-----------------|---------------|--------------------------|----------------|----------|
| 3-Meter OATS                    | TEI             | N/A           | N/A                      | Listed 1/13/03 | 1/13/06  |
| Biconnical Antenna              | Eaton           | 94455-1       | 1057                     | CAL 3/18/03    | 3/18/05  |
| Biconnical Antenna              | Eaton           | 94455-1       | 1096                     | CAL 10/1/01    | 10/1/03  |
| Double-Ridged Horn Antenna      | Electro-Metrics | RGA-180       | 2319                     | CAL 2/17/03    | 2/17/05  |
| LISN                            | Electro-Metrics | ANS-25/2      | 2604                     | CAL 10/9/01    | 10/9/03  |
| LISN                            | Electro-Metrics | EM-7820       | 2682                     | CAL 3/12/03    | 3/12/05  |
| Log-Periodic Antenna            | Eaton           | 96005         | 1243                     | CAL 5/8/03     | 5/8/05   |
| Log-Periodic Antenna            | Electro-Metrics | EM-6950       | 632                      | CHAR 10/15/01  | 10/15/03 |
| Log-Periodic Antenna            | Electro-Metrics | LPA-25        | 1122                     | CAL 10/2/01    | 10/2/03  |
| Log-Periodic Antenna            | Electro-Metrics | LPA-30        | 409                      | CAL 3/4/03     | 3/4/05   |
| Peak Power Meter                | HP              | 8900C         | 2131A00545               | CAL 7/2/03     | 7/2/05   |
| Power Meter                     | HP              | 432A          | 1141A07655               | CAL 4/15/03    | 4/15/05  |
| Silver Tower Preamplifier       | HP              | 8449B         | 3008A01075               | CHAR 1/28/02   | 1/28/04  |
| Silver Tower Quasi-Peak Adapter | HP              | 85650A        | 3303A01844               | CAL 10/14/02   | 10/14/04 |
| Silver Tower RF Preselector     | HP              | 85685A        | 2620A00294               | CAL 10/14/02   | 10/14/04 |
| Silver Tower Spectrum Analyzer  | HP              | 8566B Opt 462 | 3552A22064<br>3638A08608 | CAL 10/14/02   | 10/14/04 |
| Tan Tower Preamplifier          | HP              | 8449B-H02     | 3008A00372               | CHAR 3/4/01    | 3/4/03   |
| Tan Tower Quasi-Peak Adapter    | HP              | 85650A        | 3303A01690               | CAL 8/31/01    | 8/31/03  |
| Tan Tower RF Preselector        | HP              | 85685A        | 3221A01400               | CAL 8/31/01    | 8/31/03  |
| Tan Tower Spectrum Analyzer     | HP              | 8566B Opt 462 | 3138A07786<br>3144A20661 | CAL 8/31/01    | 8/31/03  |
| Harmonic Mixer                  | HP              | 11970K        | 3003A04991               | N/A            | N/A      |
| HORN                            | SYSTRON DONNOR  | DBE-520-20    | N/A                      | N/A            | N/A      |

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## TEST PROCEDURE

**GENERAL:** This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC.

**POWER LINE CONDUCTED INTERFERENCE:** The procedure used was ANSI STANDARD C63.4-2000 using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The ambient temperature of the UUT was 76°F with a humidity of 55%.

**BANDWIDTH 6.0dB:** The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=1 MHz and the video bandwidth (VBW) =3 MHz and the span set as shown on plot.

**POWER OUTPUT:** The RF power output was measured at the antenna feed point using a peak power meter.

**ANTENNA CONDUCTED EMISSIONS:** The RBW=100 kHz, VBW=300 kHz and the span set to 10.0MHz and the spectrum was scanned from 30MHz to the 10<sup>th</sup> Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

**RADIATION INTERFERENCE:** The test procedure used was ANSI STANDARD C63.4-2000 using a HEWLETT PACKARD spectrum analyzer with a pre-selector. The bandwidth (RBW) of the spectrum analyzer was 100 kHz up to 1 GHz and 1 MHz above 1GHz with an appropriate sweep speed. The VBW above 1.0GHz was = 3.0MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 53°F with a humidity of 17%.

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**APPLICANT:** PARKERVISION INC.

**FCC ID:** JFE-D2D00003

**NAME OF TEST:** POWER LINE CONDUCTED INTERFERENCE

**RULES PART NO.:** 15.107(a)

| <b>REQUIREMENTS:</b> | <b>QUASI-PEAK</b> | <b>AVERAGE</b> |
|----------------------|-------------------|----------------|
| .15 - 0.5 MHz        | 66-56 dBuV        | 56-46 dBuV     |
| 0.5 - 5.0            | 56                | 46             |
| 5.0 - 30.            | 60                | 50             |

**TEST PROCEDURE:** ANSI STANDARD C63.4-1992. The spectrum was scanned from .15 to 30 MHz.

**TEST DATA:**

**THE PLOTS ON THE FOLLOWING PAGES REPRESENT THE EMISSIONS TAKEN FOR THIS DEVICE.**

**TEST RESULTS:** Both lines were observed. The measurements indicate that the unit DOES appear to meet the FCC requirements for this class of equipment.

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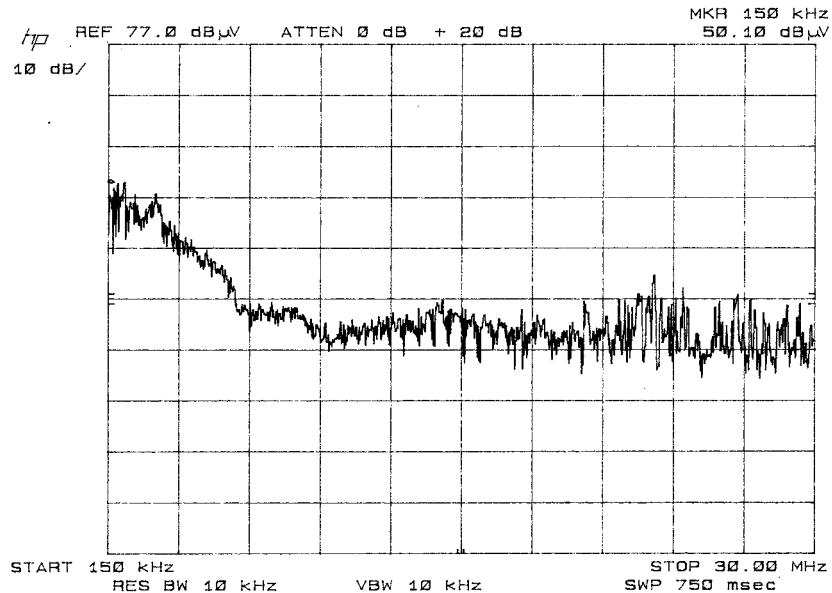
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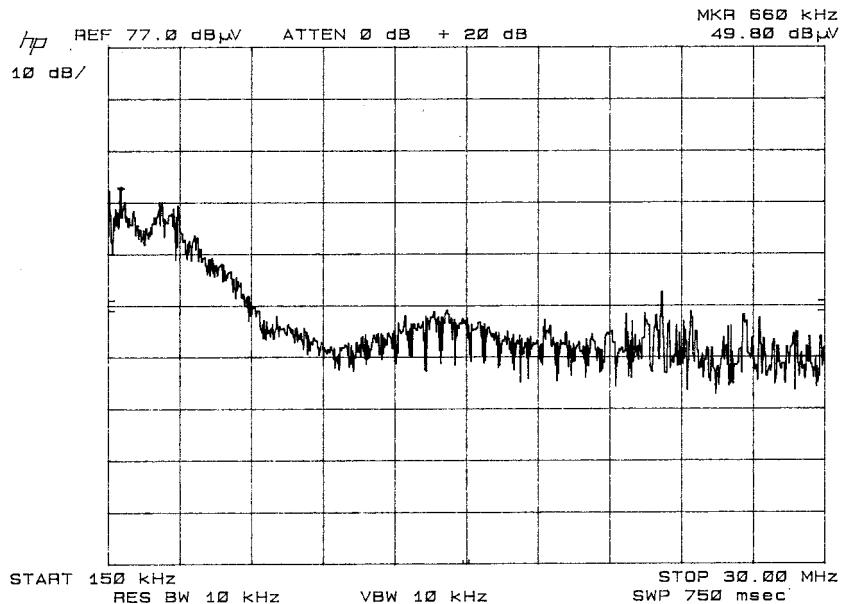
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## POWER LINE CONDUCTED LINE 1



## LINE 2



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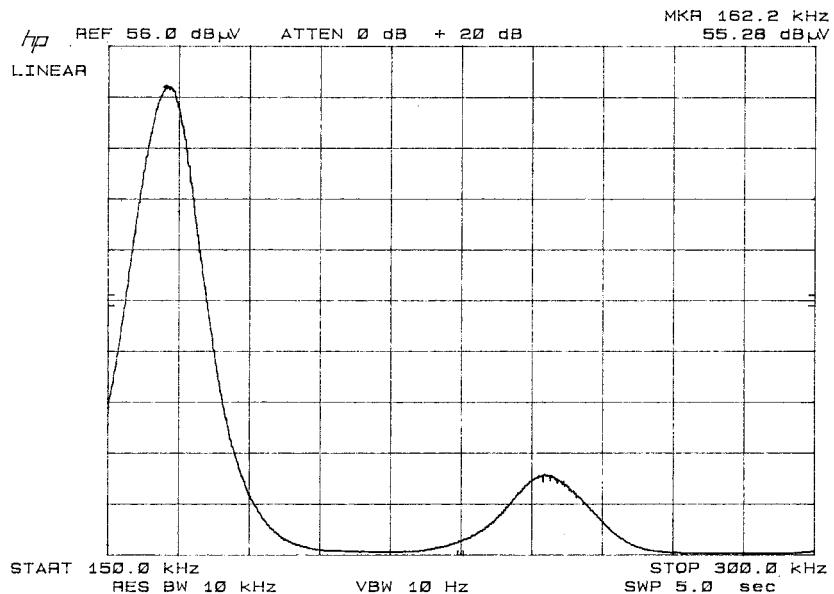
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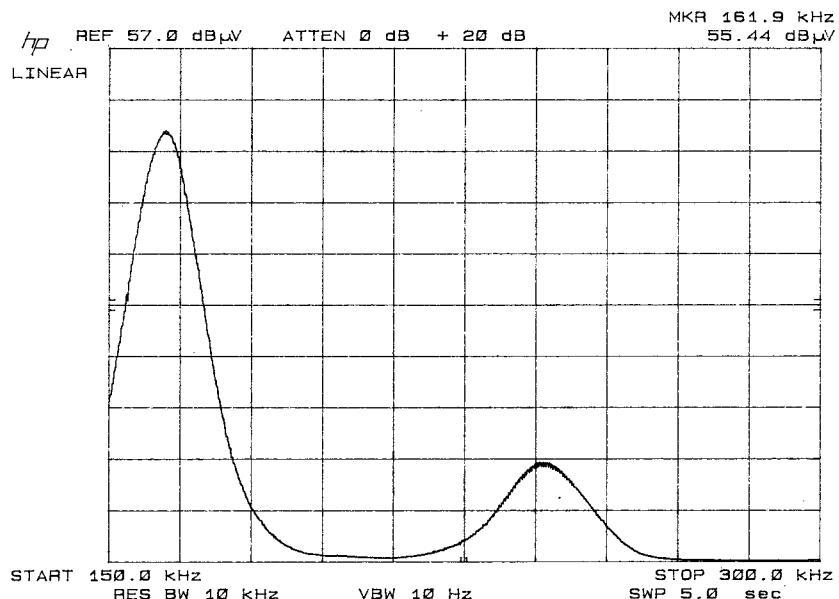
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## POWER LINE CONDUCTED LINEAR AVERAGING LINE 1



## LINE 2



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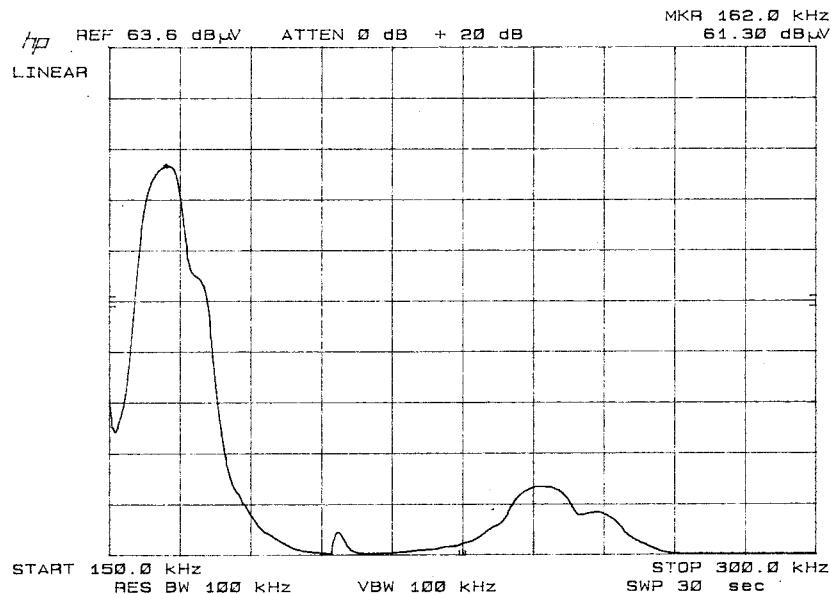
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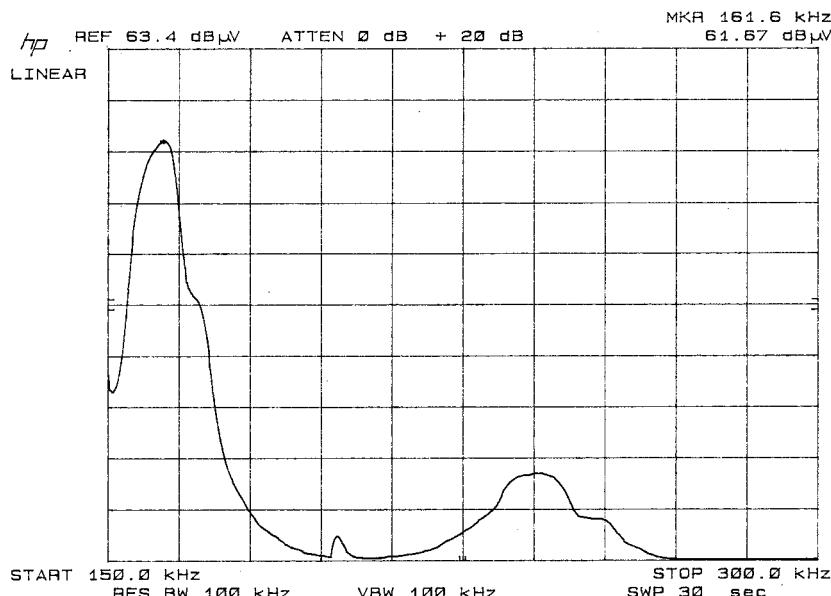
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## POWER LINE CONDUCTED QUASI PEAK LINE 1



## LINE 2



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**APPLICANT:** PARKERVISION INC.

**FCC ID:** JFE-D2D00003

**NAME OF TEST:** 6.0dB BANDWIDTH

**RULES PART NO.:** 15.247(a)(2)

**REQUIREMENTS:** The 6.0dB bandwidth must be greater than 500 kHz.

**MEASUREMENT:** The 6.0dB bandwidth measured @ 2412 MHz was 10.33 MHz.

**MEASUREMENT**

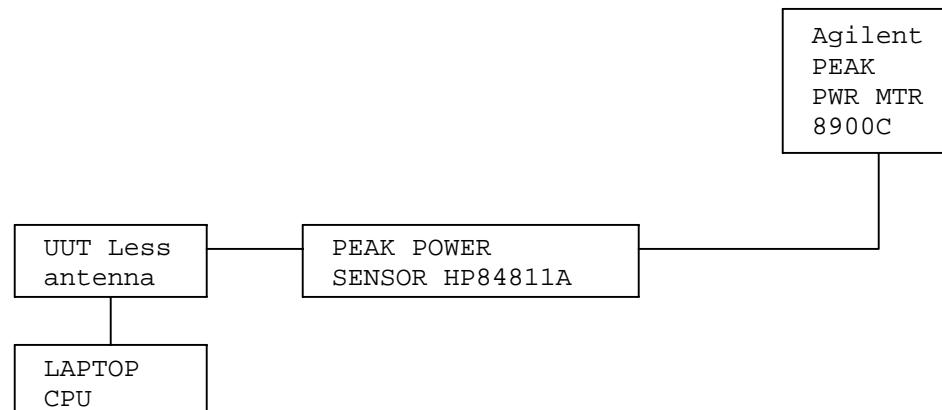
**DATA:** See the following plots

**NAME OF TEST:** POWER OUTPUT

**RULES PART NO.:** 15.247(b) 1.0Watt or +30dBm  
250mW Watts or 24dBm for 24dBi Gain Ant

**MEASUREMENT:** 100 mWatts or 20.0 dBm @ 2412.0MHz

**15.247(c)** Method of Measuring RF Power output: The Peak power Sensor was connected in place of the antenna.



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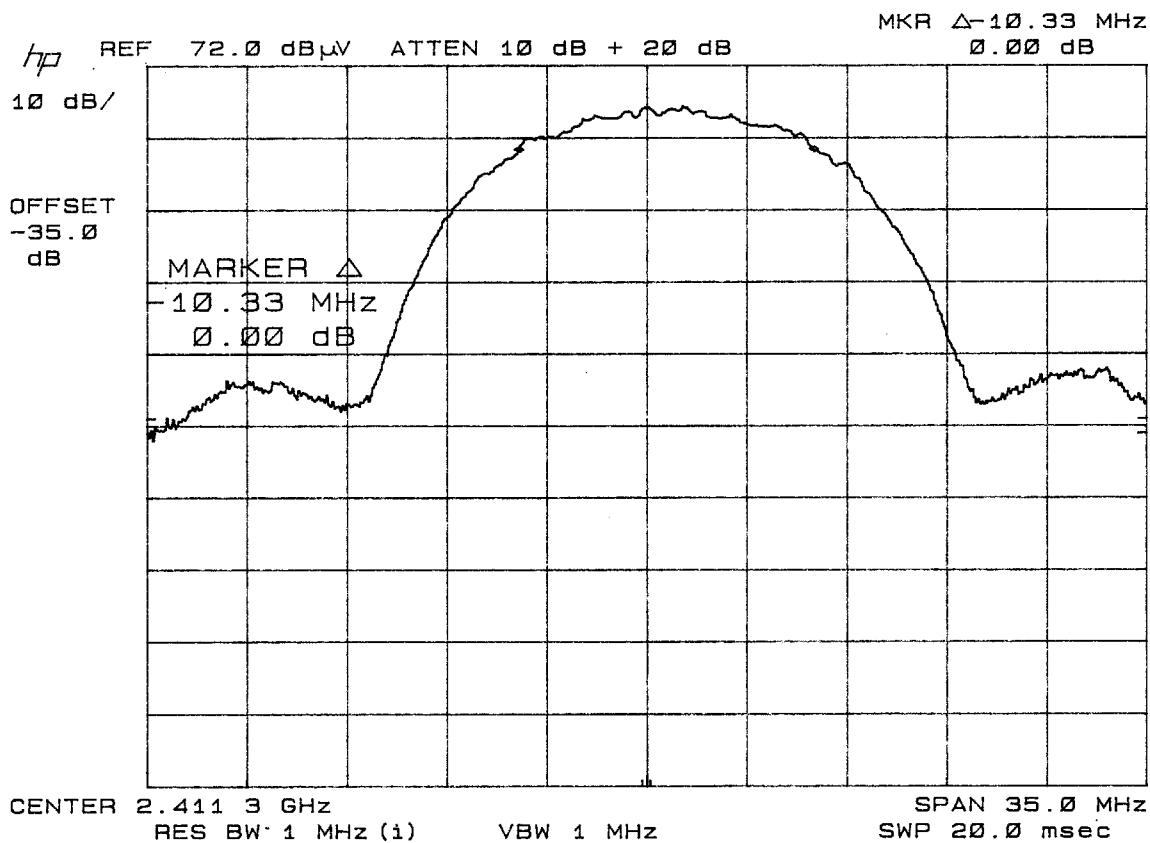
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## 6dB BANDWIDTH PLOT



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**NAME OF TEST:** SPURIOUS EMISSIONS AT ANTENNA TERMINALS

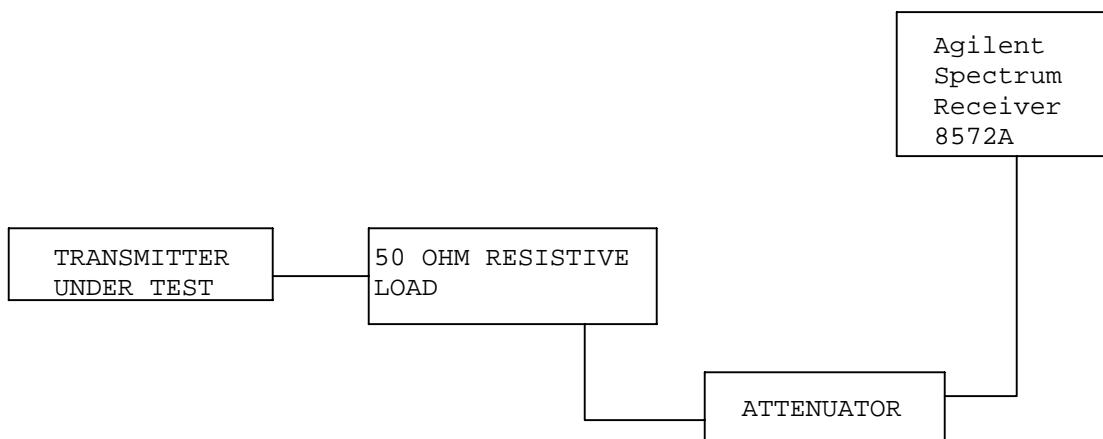
**REQUIREMENTS:** Emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

**TEST DATA:**

| TF<br>LOW POWER | EF   | dB below<br>carrier | TF<br>HIGH POWER | EF   | dB below<br>carrier |
|-----------------|------|---------------------|------------------|------|---------------------|
| 2412            | 2412 | 0.0                 | 2437             | 1625 | 105.2               |
|                 | 3216 | 95.9                |                  | 2437 | 0.0                 |
|                 | 4824 | 98.6                |                  | 3249 | 94.4                |
|                 | 7236 | 89.7                |                  | 4874 | 98.2                |
|                 | 9648 | 90.9                |                  | 6498 | 107.8               |
|                 |      |                     |                  | 7311 | 78.2                |
|                 |      |                     |                  | 9748 | 93.6                |
| TF<br>LOW POWER | EF   | dB below<br>carrier |                  |      |                     |
| 2462            | 1641 | 100.7               |                  |      |                     |
|                 | 2462 | 0.0                 |                  |      |                     |
|                 | 3282 | 92.0                |                  |      |                     |
|                 | 4923 | 94.2                |                  |      |                     |
|                 | 7386 | 71.9                |                  |      |                     |
|                 | 9848 | 96.8                |                  |      |                     |

NOTE: THE SPECTRUM WAS SCANNED TO THE TENTH HARMONIC.

15.247(c) Method of Measuring RF Conducted Spurious Emissions



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15.247(c), 15.205 &15.209(b) Field\_strength\_of\_spurious\_emissions:

## REQUIREMENTS:

| FIELD STRENGTH<br>of Fundamental: | FIELD STRENGTH<br>of Harmonics | S15.209                |
|-----------------------------------|--------------------------------|------------------------|
| 902-928MHz                        | 30 - 88 MHz 40 dBuV/m @3M      | 88 - 216 MHz 43.5      |
| 2.4-2.4835GHz                     | 127.37dBuV/m                   | 216 - 960 MHz 46       |
|                                   | 54 dBuV/m @3m                  | ABOVE 960 MHz 54dBuV/m |

EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 20 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS IN 15.209, WHICHEVER IS THE LESSER ATTENUATION.

## REQUIREMENTS FOR EMISSIONS THAT FALL IN A RESTRICTED BAND:

FIELD STRENGTH LIMITS FOR PEAK READINGS: 74 dBuV/m

FIELD STRENGTH LIMITS FOR AVERAGE READINGS: 54 dBuV/m

## TEST DATA:

| Tuned<br>Frequency<br>MHz | Emission<br>Frequency<br>MHz | Meter<br>Reading<br>dBuV | Ant.<br>Polarity | Coax<br>Loss<br>dB | Correction<br>Factor<br>dB | Field<br>Strength<br>dBuV/m | Margin<br>dB |
|---------------------------|------------------------------|--------------------------|------------------|--------------------|----------------------------|-----------------------------|--------------|
| 2,412.0                   | 1,608.00                     | 20.5                     | V                | 1.50               | 27.29                      | 49.29                       | 4.71         |
| 2,412.0                   | 2,412.00                     | 83.4                     | V                | 1.91               | 29.28                      | 114.59                      | 12.78        |
| 2,412.0                   | 3,216.00                     | 15.4                     | V                | 2.16               | 30.93                      | 48.49                       | 5.51         |
| 2,412.0                   | 4,824.00R                    | 16.4                     | V                | 2.65               | 34.04                      | 53.09AV                     | 0.91         |
| 2,412.0                   | 4,824.00R                    | 28.1                     | V                | 2.65               | 34.04                      | 64.79PK                     | 9.21         |
| 2,412.0                   | 7,238.00                     | 10.1                     | V                | 3.37               | 36.66                      | 50.13                       | 44.46        |
| 2,412.0                   | 7,238.00                     | 19.6                     | V                | 3.37               | 36.66                      | 59.63                       | 34.90        |
| 2,412.0                   | 9,647.00                     | 16.8                     | V                | 3.86               | 38.69                      | 59.35                       | 35.24        |
| 2,412.0                   | 9,647.00                     | 22.9                     | V                | 3.86               | 38.69                      | 65.45                       | 29.14        |
| 2,437.0                   | 1,624.60R                    | 20.1                     | V                | 1.51               | 27.35                      | 48.96                       | 5.04         |
| 2,437.0                   | 2,437.00                     | 82.9                     | V                | 1.92               | 29.31                      | 114.13                      | 13.24        |
| 2,437.0                   | 3,249.00                     | 17.1                     | V                | 2.17               | 31.00                      | 50.27                       | 43.86        |
| 2,437.0                   | 4,874.00R                    | 15.3                     | V                | 2.66               | 34.20                      | 52.16AV                     | 1.84         |
| 2,437.0                   | 4,874.00R                    | 24.2                     | V                | 2.66               | 34.20                      | 61.06PK                     | 12.94        |
| 2,437.0                   | 7,311.00R                    | 10.7                     | V                | 3.39               | 36.61                      | 50.70AV                     | 3.30         |
| 2,437.0                   | 7,311.00R                    | 22.1                     | V                | 3.39               | 36.61                      | 62.10PK                     | 11.90        |
| 2,437.0                   | 9,748.00                     | 13.7                     | V                | 3.87               | 38.90                      | 56.47                       | 37.66        |
| 2,437.0                   | 9,748.00                     | 23.7                     | V                | 3.87               | 38.90                      | 66.47                       | 27.66        |
| 2,462.0                   | 1,641.30                     | 19.6                     | V                | 1.52               | 27.41                      | 48.53                       | 45.05        |
| 2,462.0                   | 2,462.00                     | 82.3                     | V                | 1.93               | 29.35                      | 113.58                      | 13.79        |
| 2,462.0                   | 3,282.00                     | 14.2                     | V                | 2.18               | 31.06                      | 47.44                       | 46.14        |
| 2,462.0                   | 3,282.00                     | 16.3                     | V                | 2.18               | 31.06                      | 49.54                       | 44.04        |
| 2,462.0                   | 4,923.00R                    | 25.6                     | V                | 2.68               | 34.35                      | 62.63PK                     | 11.37        |
| 2,462.0                   | 4,924.00R                    | 14.4                     | V                | 2.68               | 34.36                      | 51.44AV                     | 2.56         |
| 2,462.0                   | 9,848.00                     | 11.4                     | V                | 3.88               | 39.10                      | 54.38                       | 39.20        |
| 2,462.0                   | 9,848.00                     | 17.6                     | V                | 3.88               | 39.10                      | 60.58                       | 33.00        |

Note: the spectrum was scanned to the tenth harmonic

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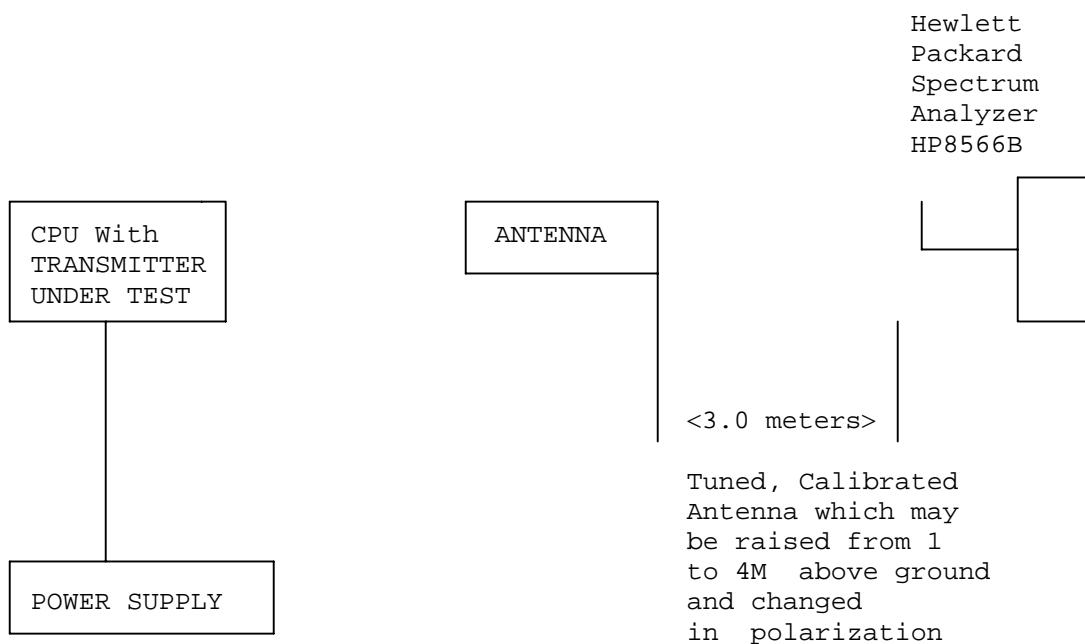
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## Method of Measuring Radiated Spurious Emissions



Equipment placed 80cm above ground on a rotatable platform.

**METHOD OF MEASUREMENT:** The procedure used was ANSI STANDARD C63.4-2000 and the FCC/OET Guidance on Measurements for Direct Sequence Spread Spectrum Systems - Public Notice 54797 Dated July 12, 1995. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

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**APPLICANT:** PARKERVISION INC.

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**NAME OF TEST:** RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

**REQUIREMENTS:** Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 uV/m (54 dBuV/m).

**TEST PROCEDURE:** An in band field strength measurement of the fundamental Emission using the RBW and detector function required by C63.4-2000 and FCC Rules. The procedure was repeated with an average detector and a plot made. The calculated field strength in the adjacent restricted band is presented below.

| Average                | Average                |
|------------------------|------------------------|
| CHANNEL 1              | CHANNEL 11             |
| FREQUENCY: 2381.00 MHz | FREQUENCY: 2483.50 MHz |
| + 1.80 dBuV from plot  | - 0.50 dBuV from plot  |
| +29.23 dB ACF          | +29.38 dB ACF          |
| + 1.89 dB Coax Loss    | + 1.94 dB Coax Loss    |
| +20.00 dB Attn. Pad    | +20.00 dB Attn. Pad    |
| <hr/> +52.92 dBuV      | <hr/> +50.82 dBuV      |

| Peak                   | Peak                   |
|------------------------|------------------------|
| CHANNEL 1              | CHANNEL 11             |
| FREQUENCY: 2381.00 MHz | FREQUENCY: 2483.50 MHz |
| +12.10 dBuV from plot  | +12.10 dBuV from plot  |
| +29.23 dB ACF          | +29.38 dB ACF          |
| + 1.89 dB Coax Loss    | + 1.94 dB Coax Loss    |
| +20.00 dB Attn. Pad    | +20.00 dB Attn. Pad    |
| <hr/> +63.22 dBuV      | <hr/> +63.42 dBuV      |

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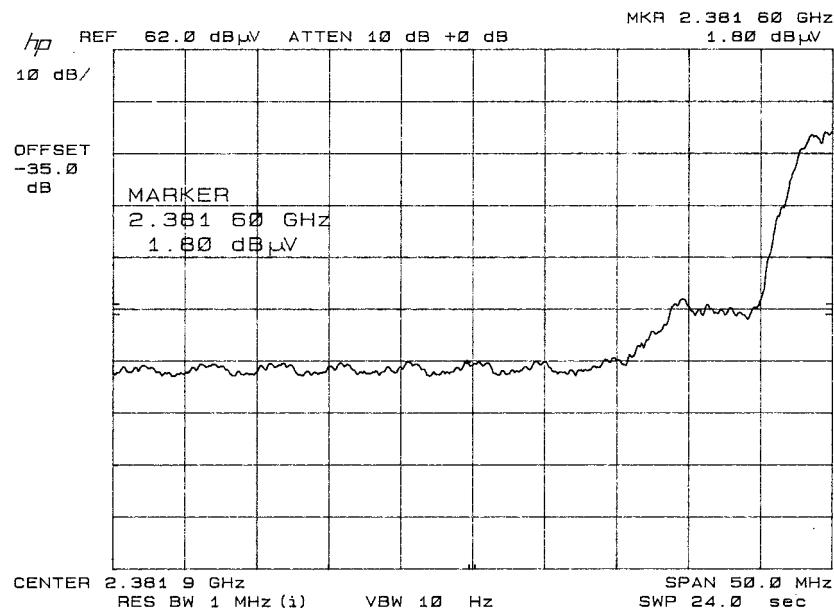
849 NW State Road 45

Newberry, Florida 32669

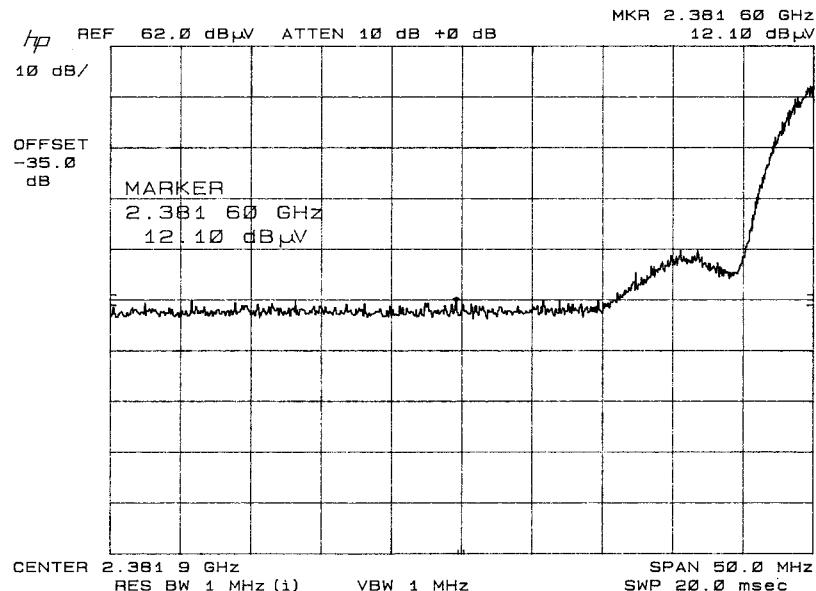
<http://www.timcoengr.com>

888.472.2424 F 352.472.2030 email: [sid@timcoengr.com](mailto:sid@timcoengr.com)

## AVERAGE - CHANNEL 1



## PEAK - CHANNEL 1



APPLICANT: PARKERVISION INC.

FCC ID: JFE-D2D00003

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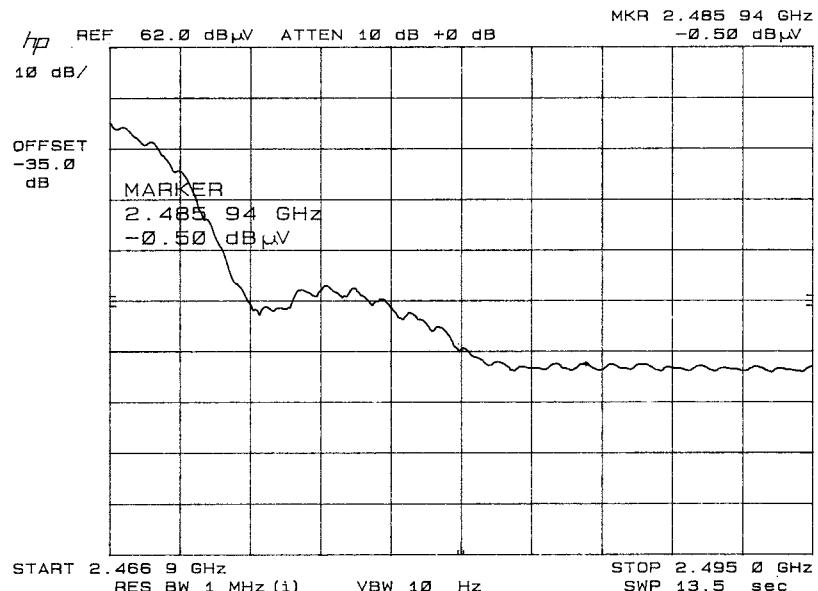
849 NW State Road 45

Newberry, Florida 32669

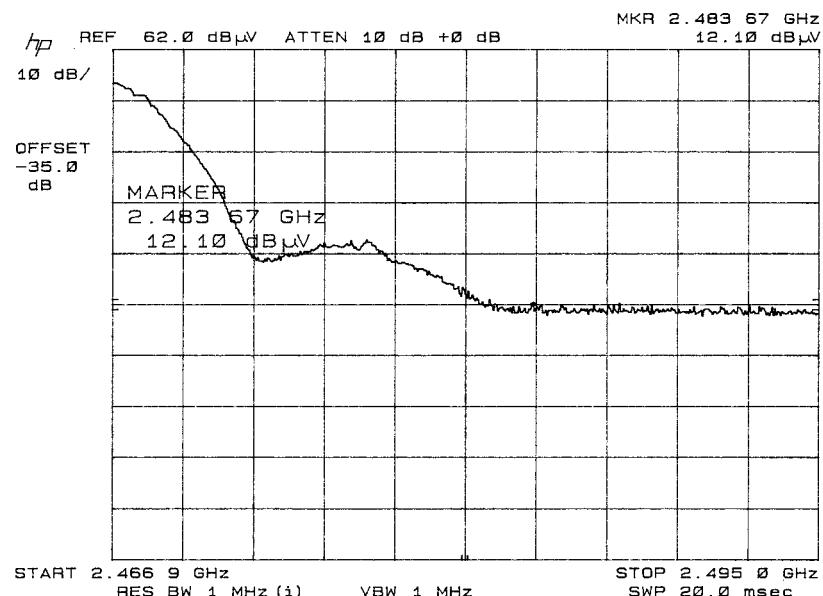
<http://www.timcoengr.com>

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## AVERAGE - CHANNEL 11



## PEAK - CHANNEL 11



APPLICANT: PARKERVISION INC.

FCC ID: JFE-D2D00003

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**APPLICANT:** PARKERVISION INC.

**FCC ID:** JFE-D2D00003

**NAME OF TEST:** POWER SPECTRAL DENSITY

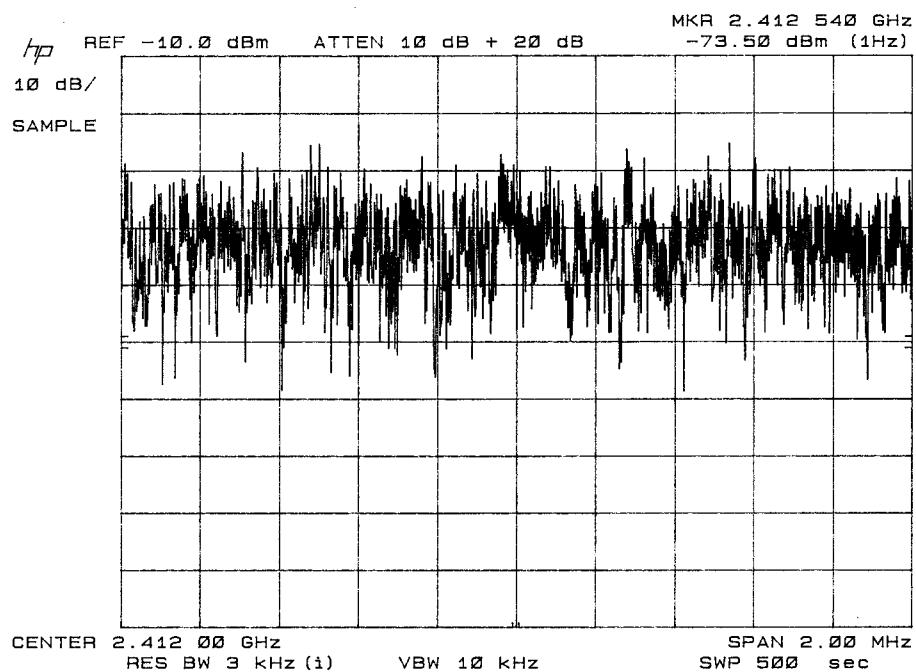
**RULES PART NO.:** 15.247(d)

**REQUIREMENTS:** The peak level measured must be no greater than +8.0dBm.

**DATA:** SEE THE FOLLOWING PLOTS

The level at 2432.94 MHz was -71.90 dBm.

|           |                   |
|-----------|-------------------|
| +20 dB    | Attn.             |
| +35 dB    | Correction Factor |
| <hr/>     |                   |
| +55 dB    |                   |
| -73.5 dBm | from plot         |
| <hr/>     |                   |
| -18.5 dBm |                   |



APPLICANT: PARKERVISION INC.

FCC ID: JFE-D2D00003

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