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# IC RSS-119 Certification Application

## For The

## Guardian
## VHF RADIO MODEM

## FCC ID: NP4-5096-500

TABLE OF CONTENTS



*Measurements were made between December 1, 2010 and December 5, 2010 in accordance with RSS-119 issue 9 and RSS-Gen issue 2.

NAME OF TEST: Transmitter Rated Power Output

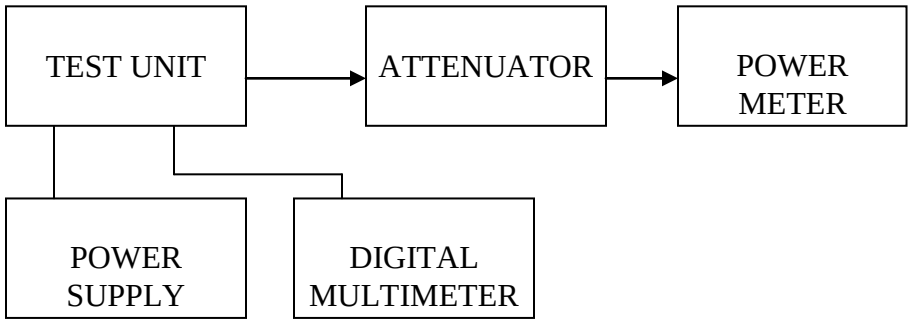
RULE PART NUMBER: FCC: 2.1046(a) (c),22.535, 24.132, 101.113 (a)

TEST RESULTS: See results below

TEST CONDITIONS: Standard Test Conditions

TEST EQUIPMENT: 50-Ohm Attenuator, Bird 50-A-FFN-20 / 20 dB / 50 Watt
Power Supply, Instek Model GPS-3303
Digital Multimeter, Fluke 87
Power Meter, Model HP-8901B

TEST SET-UP:




TEST RESULTS:

| Frequency ( MHz ) | DC Voltage at Final ( Vdc ) | DC Current into Final ( Adc ) | DC Power into Final ( W ) | RF Power Output ( W ) |
|---|---|---|---|---|
| 928.50625 | 12.6 | 2.219 | 28.0 | 10.0 |
| 928.50625 | 7.6 | 0.79 | 6.0 | 1.0 |
| 932.5125 | 12.6 | 2.12 | 26.7 | 10.0 |
| 932.5125 | 7.6 | 0.76 | 5.8 | 1.0 |
| 934.9125 | 12.6 | 2.13 | 26.8 | 10.0 |
| 934.9125 | 7.6 | 0.76 | 5.8 | 1.0 |
| 941.5125 | 12.6 | 2.05 | 25.8 | 10.0 |
| 941.5125 | 7.6 | 0.74 | 5.6 | 1.0 |
| 943.9125 | 12.6 | 2.05 | 25.8 | 10.0 |
| 943.9125 | 7.6 | 0.74 | 5.6 | 1.0 |
| 952.5125 | 12.6 | 2.10 | 26.5 | 10.0 |
| 952.5125 | 7.6 | 0.76 | 5.8 | 1.0 |

Part 22 Effective Radiated Power Limits:

| Frequency range (MHz) | Maximum ERP (Watts) |
|---|---|
| 35–36 | 600 |
| 43–44 | 500 |
| 152–159 | 1400 |
| 931–932 | 3500 |

NAME OF TEST: Transmitter Spurious and Harmonic Outputs

RULE PART NUMBER: FCC: 2.1051, 90.210 (g)(d,3), 101.111(5)(6), 24.133, 22.359;

MINIMUM STANDARDS: For 12 Watts: $50+10\text{Log}_{10}(12\text{ Watts})$ = -60.8 dBc
or -70dBc, whichever is the lesser attenuation.

For 1 Watt: $50+10\text{Log}_{10}(1\text{ Watt})$ = -50 dBc
or –70 dBc, whichever is the lesser attenuation.

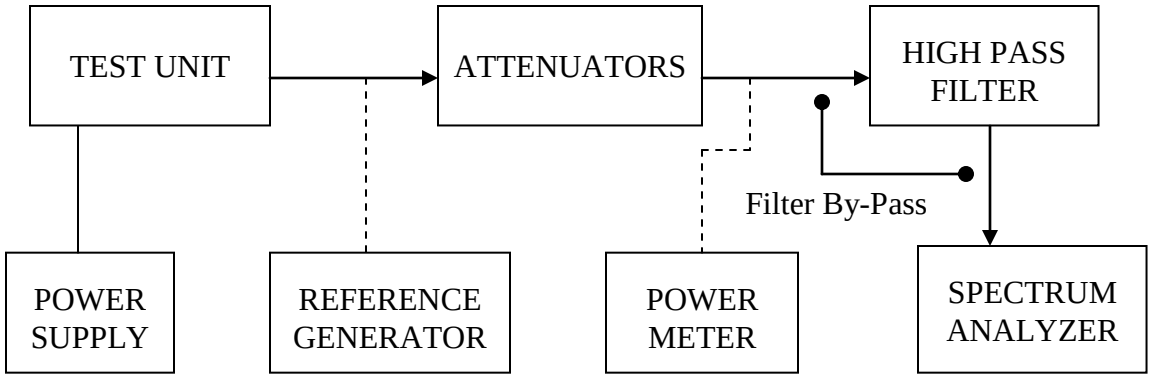
TEST RESULTS: Meets minimum standards ( see data on following pages )

TEST CONDITIONS: Standard Test Conditions, 25 C
RF Voltage measured at antenna terminals

TEST PROCEDURE: TIA/EIA – 603-C

TEST EQUIPMENT: 50-Ohm Attenuator, Narda 765-10 / 10 dB / 50 Watts
50-Ohm Attenuator, Bird 10-A-MFN-10 / 10 dB / 10 Watts
Power Supply, Instek Model GPS-3303
Spectrum Analyzer, HP-8563E
Reference Generator, Agilent E8257D
High Pass Filter, Mini Circuits VHF-740, Fc = 740 MHz

TEST SET-UP:




MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 928.025, 943.1, and 952.975. The reference oscillator frequency is 23.040 MHz. The power amplifier has voltage levels at 12.6 Volts and 7.6 Volts for 10 watts and 1 watt, respectively.
2. The carrier reference was established on the spectrum analyzer with the filter by-pass in place. Then the spectrum was scanned from DC to 2 Fc. Finally, the high pass filter was inserted to null the carrier fundamental and extend the range of the spectrum analyzer for harmonic measurements above 2 Fc.
3. At each spurious frequency, generation substitution was used to establish the true spurious level.
4. The spectrum was scanned to the $10^{th}$ harmonic of the highest internally generated frequency.

| | | |
|---|---|---|
| Tuned Frequency | 928.025 | MHz |
| Power | 10.0 | Watts |
| | 40.0 | dBm |
| Min Specification | -65.0 | dBc |
| Worse Case | -85.5 | dBc |

| Spurious Frequency (MHz) | Harmonic | Relative to Carrier (dBc) |
|---|---|---|
| 1856.050 | 2 | -85.5 |
| 2784.075 | 3 | -90.0 |
| 3712.100 | 4 | -119.5 |
| 4640.125 | 5 | -101.0 |
| 5568.150 | 6 | -109.7 |
| 6496.175 | 7 | -103.3 |
| 7424.200 | 8 | -118.3 |
| 8352.225 | 9 | -108.5 |
| 9280.250 | 10 | -115.3 |

| | | |
|---|---|---|
| Tuned Frequency | 928.025 | MHz |
| Power | 1.0 | Watts |
| | 30.0 | dBm |
| Min Specification | -55.0 | dBc |
| Worse Case | -88.5 | dBc |

| Spurious Frequency (MHz) | Harmonic | Relative to Carrier (dBc) |
|---|---|---|
| 1856.050 | 2 | -88.5 |
| 2784.075 | 3 | -97.2 |
| 3712.100 | 4 | -109.5 |
| 4640.125 | 5 | -102.7 |
| 5568.150 | 6 | -99.7 |
| 6496.175 | 7 | -111.3 |
| 7424.200 | 8 | -108.3 |
| 8352.225 | 9 | -106.5 |
| 9280.250 | 10 | -105.3 |

| | | |
|---|---|---|
| Tuned Frequency | 943.1 | MHz |
| Power | 10.0 | Watts |
| | 40.0 | dBm |
| Min Specification | -65.0 | dBc |
| Worse Case | -88.0 | dBc |

| Spurious Frequency (MHz) | Harmonic | Relative to Carrier (dBc) |
|---|---|---|
| 1886.200 | 2 | -93.5 |
| 2829.300 | 3 | -91.7 |
| 3772.400 | 4 | -120.5 |
| 4715.500 | 5 | -106.8 |
| 5658.600 | 6 | -114.7 |
| 6601.700 | 7 | -104.0 |
| 7544.800 | 8 | -113.5 |
| 8487.900 | 9 | -110.2 |
| 9431.000 | 10 | -114.8 |

| | | |
|---|---|---|
| Tuned Frequency | 943.1 | MHz |
| Power | 1.0 | Watts |
| | 30.0 | dBm |
| Min Specification | -55.0 | dBc |
| Worse Case | -78.0 | dBc |

| Spurious Frequency (MHz) | Harmonic | Relative to Carrier (dBc) |
|---|---|---|
| 1886.200 | 2 | -95.2 |
| 2829.300 | 3 | -99.2 |
| 3772.400 | 4 | -110.5 |
| 4715.500 | 5 | -104.8 |
| 5658.600 | 6 | -104.7 |
| 6601.700 | 7 | -113.0 |
| 7544.800 | 8 | -108.5 |
| 8487.900 | 9 | -100.2 |
| 9431.000 | 10 | -104.8 |

| | | |
|---|---|---|
| Tuned Frequency | 952.975 | MHz |
| Power | 10.0 | Watts |
| | 40.0 | dBm |
| Min Specification | -65.0 | dBc |
| Worse Case | -86.0 | dBc |

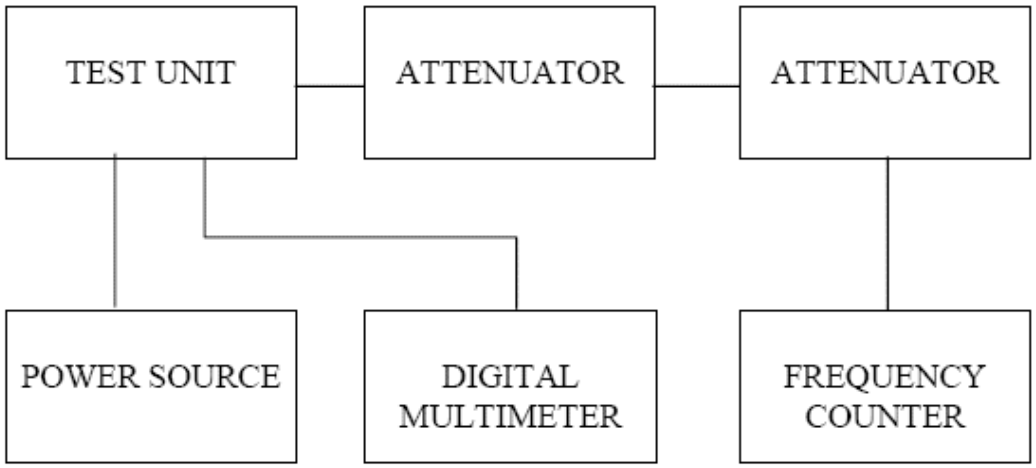
| Spurious Frequency (MHz) | Harmonic | Relative to Carrier (dBc) |
|---|---|---|
| 1905.950 | 2 | -92.8 |
| 2858.925 | 3 | -91.2 |
| 3811.900 | 4 | -119.8 |
| 4764.875 | 5 | -102.7 |
| 5717.850 | 6 | -115.5 |
| 6670.825 | 7 | -103.5 |
| 7623.800 | 8 | -114.5 |
| 8576.775 | 9 | -90.2 |
| 9529.750 | 10 | -111.7 |

| | | |
|---|---|---|
| Tuned Frequency | 952.975 | MHz |
| Power | 1.0 | Watts |
| | 30.0 | dBm |
| Min Specification | -55.0 | dBc |
| Worse Case | -76.0 | dBc |

| Spurious Frequency (MHz) | Harmonic | Relative to Carrier (dBc) |
|---|---|---|
| 1905.950 | 2 | -82.8 |
| 2858.925 | 3 | -81.2 |
| 3811.900 | 4 | -109.8 |
| 4764.875 | 5 | -92.7 |
| 5717.850 | 6 | -105.5 |
| 6670.825 | 7 | -93.5 |
| 7623.800 | 8 | -104.5 |
| 8576.775 | 9 | -80.2 |
| 9529.750 | 10 | -101.7 |

| | |
|---|---|
| NAME OF TEST: | Frequency Stability with Variation in Supply Voltage |
| RULE PART NUMBER: | FCC: 2.1055 (d)(1), 90.213 (a), 101.107, 24.135, 22.355; |
| MINIMUM STANDARD: | Shall not exceed 1.0 ppm. |
| TEST RESULTS: | Meets minimum standard, see data on following page |
| TEST CONDITIONS: | Standard Test Conditions, 25 C |
| TEST EQUIPMENT: | Frequency Counter, Fluke 7220A<br>DC Power Supply, Instek Model GPS-2303<br>Digital Voltmeter, Fluke Model 8012A<br>50-Ohm Attenuator, Bird Electronics Model 50-A-FFN-20 (20dB, 50W)<br>50-Ohm Attenuator, Bird Electronics Model 10-A-MFN-10 (10dB, 10W) |

TEST SET-UP:




TEST SET-UP

Channel Frequency: 928.1500 MHz
Tolerance Requirements: 1.0ppm
Highest Variation: 0.05 ppm

| Input Voltage ( Vdc ) | Frequency ( MHz ) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|---|
| 10 | 928.150050 | 50 | 0.05 |
| 20 | 928.150000 | 0 | 0.00 |
| 30 | 928.150050 | 50 | 0.05 |

NAME OF TEST: Frequency Stability with Variation in Ambient Temperature

RULE PART NUMBER: FCC: 2.1055 (d)(1), 90.213 (a), 101.107, 24.135, 22.355;

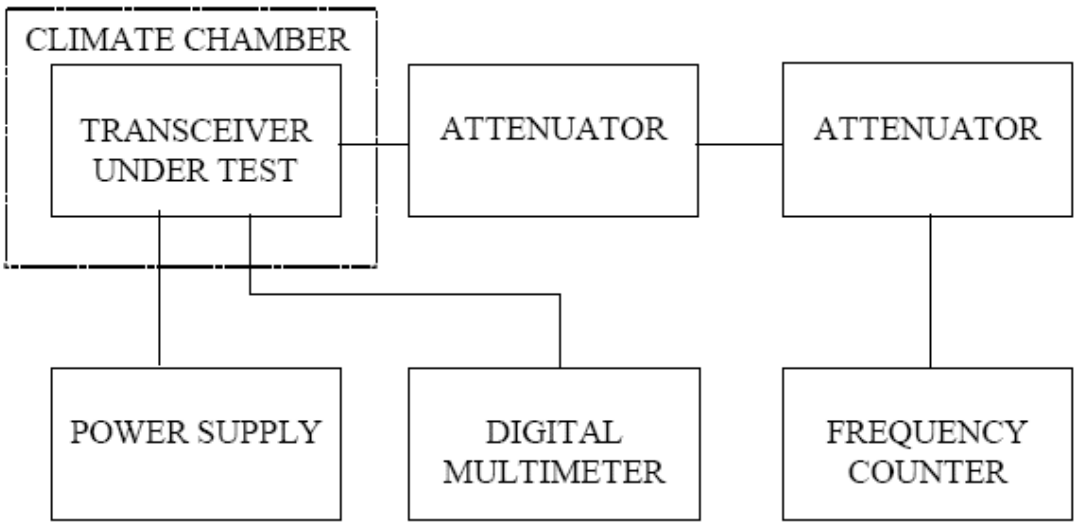
MINIMUM STANDARD: Shall not exceed 1.0 ppm from test frequency

TEST RESULTS: Meets minimum standard, see data on following page

TEST CONDITIONS: Standard Test Conditions

TEST EQUIPMENT: Frequency Counter, Fluke 7220A
DC Power Supply, Instek Model GPS-2303
Digital Voltmeter, Fluke Model 8012A
50-Ohm Attenuator, Bird Electronics Model 50-A-FFN-20 (20dB, 50W)
50-Ohm Attenuator, Bird Electronics Model 10-A-MFN-10 (10dB, 10W)
Climate Chamber, Test Equity Half Cube Model 105

TEST SET-UP:



Channel Frequency: 928.15000 MHz
Voltage & Power Level: 20 Volts @ 10 Watts
Highest Variation: 0.13 ppm

| Temperature (Deg C) | Measured Frequency (MHz) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|---|
| -30 | 928.150030 | 30 | 0.03 |
| -20 | 928.150100 | 100 | 0.11 |
| -10 | 928.150100 | 100 | 0.11 |
| 0 | 928.150120 | 120 | 0.13 |
| 10 | 928.150000 | 0 | 0.00 |
| 20 | 928.150100 | 100 | 0.11 |
| 30 | 928.150020 | 20 | 0.02 |
| 40 | 928.150040 | 40 | 0.04 |
| 50 | 928.150050 | 50 | 0.05 |
| 60 | 928.150060 | 60 | 0.06 |

Channel Frequency: 928.15000 MHz
Voltage & Power Level: 20 Volts @ 1.0 Watts
Highest Variation: 0.13 ppm

| Temperature (Deg C) | Measured Frequency (MHz) | Frequency Error (Hz) | Frequency Error (ppm) |
|---|---|---|---|
| -30 | 928.150000 | 0 | 0.00 |
| -20 | 928.150110 | 110 | 0.12 |
| -10 | 928.150120 | 120 | 0.13 |
| 0 | 928.150100 | 100 | 0.11 |
| 10 | 928.150000 | 0 | 0.00 |
| 20 | 928.150110 | 110 | 0.12 |
| 30 | 928.150000 | 0 | 0.00 |
| 40 | 928.150060 | 60 | 0.06 |
| 50 | 928.150060 | 60 | 0.06 |
| 60 | 928.150050 | 50 | 0.05 |

NAME OF TEST: Transmitter Occupied Bandwidth

RULE PART NUMBER: FCC: 2.201, 2.202, 2.1033 (c)(14), 2.1049 (h), 2.1041, 90.203(j)(3), 24.131, 101.109, 22.359;

Necessary Bandwidth Measurement

This radio modem uses digital modulation signals, passing through a Squared Root Raised Cosine $\alpha$=0.2 or $\alpha$=0.5 DSP implemented low-pass filter to an FM transceiver. The digital modulation is based on SRRC4FSK allows a SRRC2FSK subset to be used for lower bit rate with a better sensitivity reception. The necessary bandwidth calculation for this type of modulation is not covered by paragraphs (1), (2) or (3) from 2.202(c). Therefore, the approach outlined in (2.202(c)(4)) is applicable in this case.

The measurement explanations are provided below.

Necessary Bandwidth Measurement:

| Channel Spacing | Emission Type | Data Rate | Measured Peak Deviation | Measured 99% Occupied BW |
|---|---|---|---|---|
| 12.5 kHz | 9K55 F1D | 4800 bps | 3.55 kHz | 9.55 kHz |
| 12.5 kHz | 9K35 F1D | 9600 bps | 2.76 kHz | 9.35 kHz |
| 25 kHz | 11K6 F1D | 4800 bps | 4.43 kHz | 11.55 kHz |
| 25 kHz | 14K6 F1D | 9600 bps | 4.40 kHz | 14.55 kHz |
| 25 kHz | 16K4 F1D | 19200 bps | 4.30 kHz | 16.35 kHz |

THEORY OF MEASUREMENT

The way to define the Occupied Bandwidth is "The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth." (RSS-Gen 4.6.1). The mathematics are as follows:

$$0.005*TP=P_{(f1)}=\int_{0}^{f1} PSD_{(f)}df$$

$$0.995*TP=P_{(f2)}=\int_{0}^{f2} PSD_{(f)}df$$

$$OBW=f2-f1$$

where TP (total mean power) is

$$TP=\int_{0}^{+\infty} PSD_{(f)}df=(1/t)\int_{-\infty}^{+\infty} |z_{(t)}|^2 dt$$

and PSD (power spectral distribution) is

$$PSD_{(f)}=|Z_{(f)}|^2+|Z_{(-f)}|^2 \qquad 0\leq f<\infty$$

and expresses the positive frequency representation of the transmitter output power for z(t) signal.

By applying these mathematics to the measurements, it is possible to measure the Occupied Bandwidth using a digital spectrum analyzer.

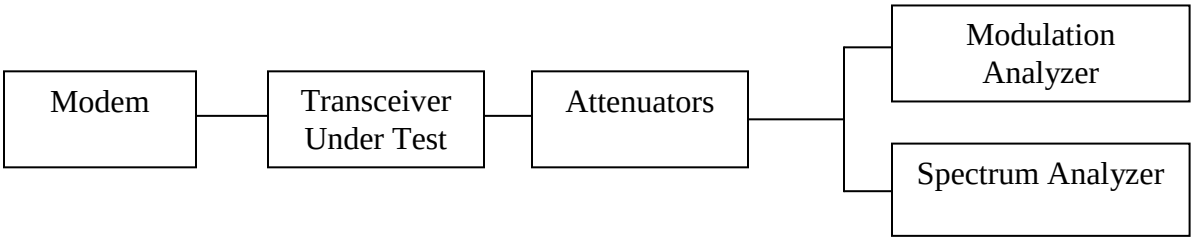
The Occupied Bandwidth measurement is in two parts relatively independent of each other. The first gives the RF spectrum profile, and the second calculates the frequency limits and they result in the Occupied bandwidth. While the first involves RF measurement instrumentation, the second is strictly a computational part related to measured trace.

TEST EQUIPMENT:

50-Ohm Attenuator, Bird Electronics Model 25-A-MFN-20 (20dB, 25W)
50-Ohm Power Splitter, Mini Circuits Model ZFSC-3-4 (5.5dB IL at UHF)
DC Power Supply, Instek Model GPS-2303
Spectrum Analyzer, Hewlett Packard Model HP8563E
Modulation Analyzer, Hewlett Packard Model HP8901A

TEST SET-UP:

For the above requirements, the occupied bandwidth of a transmitter was measured using an Advantest Model R3162 using the following settings:
Occupied BW % Power: 99%
Trace: Max Hold A
RBW: 100 Hz (12.5 kHz channels)
RBW: 300 Hz (25 kHz channels)
VBW: 3 kHz
SPAN: 100 kHz (12.5 kHz channels)
SPAN: 150 kHz (25 kHz channels)



NAME OF TEST: Transmitter Mask Emission Limits for Emission Designators **9K55F1D** and **9K35F1D**

RULE PART NUMBER: FCC: 2.202, 90.209 (b)(5), 90.210(d), 2.1049 (c) (1), 101.111 (a)(5), 24.133 a2;

MINIMUM STANDARDS:

**Mask D**
Sidebands and Spurious [Rule 5.8.3, P = 12 Watts and P=1 Watt]
Authorized Bandwidth = 11.25 kHz [Rule 5.8.3]
From Fo to 5.625 kHz, down 0 dB.
Greater than 5.625 kHz to 12.5 kHz, down $7.27(f_d\text{-}2.88\text{kHz})$ dB.
Greater than 12.5 kHz, at least $50+10\log_{10}(P)$ or 70 dB, whichever is the lesser attenuation.

Attenuation = 0 dB at Fo to 5.625 kHz
Attenuation = 20 dB at 5.625 kHz and 70 dB at 12.5 kHz
Attenuation = 60.8 dB at frequencies greater than 12.5 kHz @ 12 W
Attenuation = 50 dB at frequencies greater than 12.5 kHz @ 1 W

**Mask 101.111(a)(5)**
Sidebands and Spurious [P = 10 Watts and P=1 Watt]
Authorized Bandwidth = 12.5 kHz
From Fo to 2.5 kHz, down 0 dB.
Greater than 2.5 kHz to 6.25 kHz, down 53log(fd/2.5)
Greater than 6.25 kHz to 9.5 KHz, down 103log(fd/3.9)
Greater than 9.5 to 15 KHz, 157log(fd/5.3)
Greater than 15 KHz,, 50+10log(P) or 70 dB

Attenuation = 0 db at Fo to 6.25 kHz
Attenuation = 21.1dB at 6.25 kHz
Attenuation = 39.8 dB at 9.5 KHz
Attenuation = 70.9 dB at 15 kHz
Attenuation = 60 dB at > 15 KHz @ 10W or 50dB @ 1W

**Mask 24.133(a)(2) 12.5 kHz**
Sidebands and Spurious [P = 10 Watts and P=1 Watt]
Authorized Bandwidth = 10 kHz
From Fo to 5 kHz, down 0 dB.
From 5 kHz to 25 kHz, down $116 * \log_{10}(f_d + 5 / 3.05)$ dB, 50+10log(P) or 70 dB.
Greater than 25 kHz, $43+10\log_{10}(P)$ or 80 dB.

Attenuation = 0 db at Fo to 5 kHz
Attenuation = 25 dB at 5 kHz
Attenuation = 60 dB at 10 kHz @ 10W
Attenuation = 50 dB at 8.22 kHz @ 1W
Attenuation = 53 dB at 25 kHz @ 10W
Attenuation = 43 dB at 25 kHz @ 1W

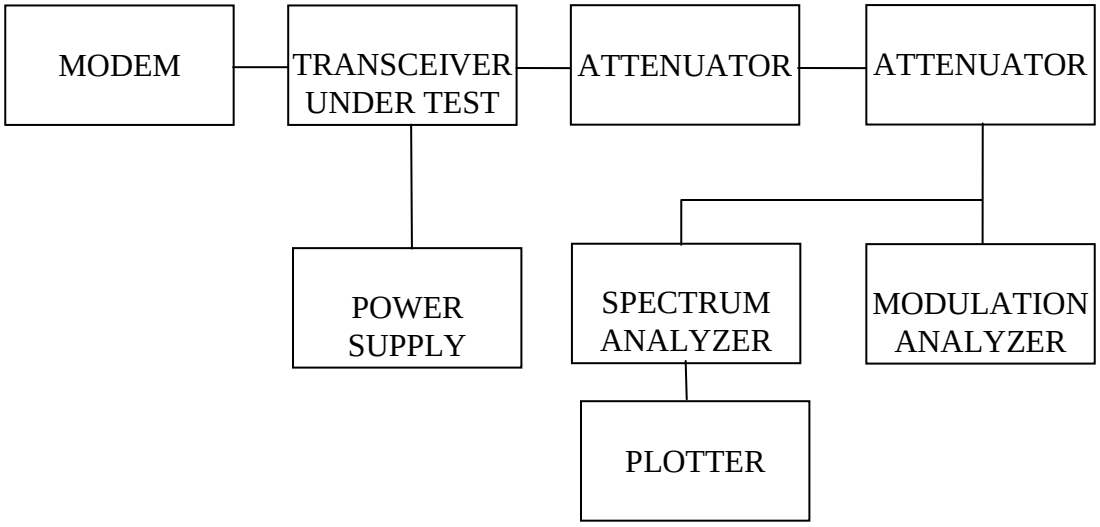
TEST RESULTS: Meets minimum standards (see data on following page)

TEST CONDITIONS: Standard Test Conditions, 25 C
RF Power Level = 1 Watt and 12 Watts
Voltage = 20VDC

TEST PROCEDURE: TIA/EIA – 603-C

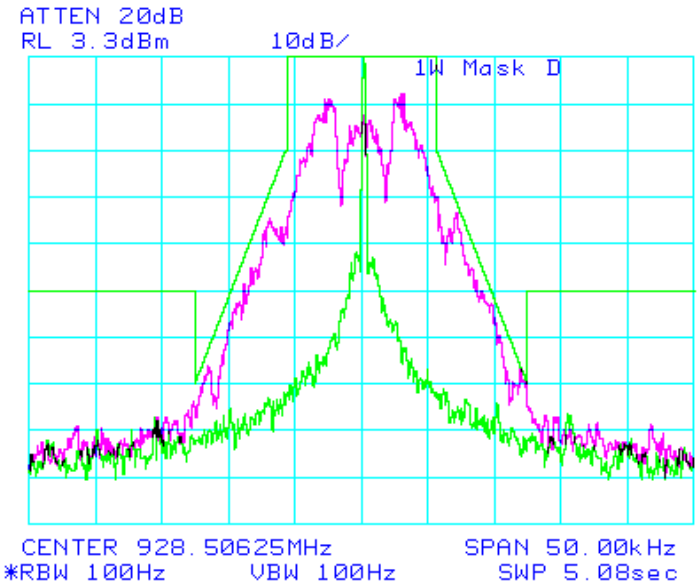
TEST EQUIPMENT: 50-Ohm Attenuator, Bird Electronics Model 25-A-MFN-20 (20dB, 25W)
50-Ohm Power Splitter, Mini Circuits Model ZFSC-3-4 (5.5dB IL at UHF)
DC Power Supply, Instek Model GPS-2303
Spectrum Analyzer, Hewlett Packard Model HP8563E
Modulation Analyzer, Hewlett Packard Model HP8901A

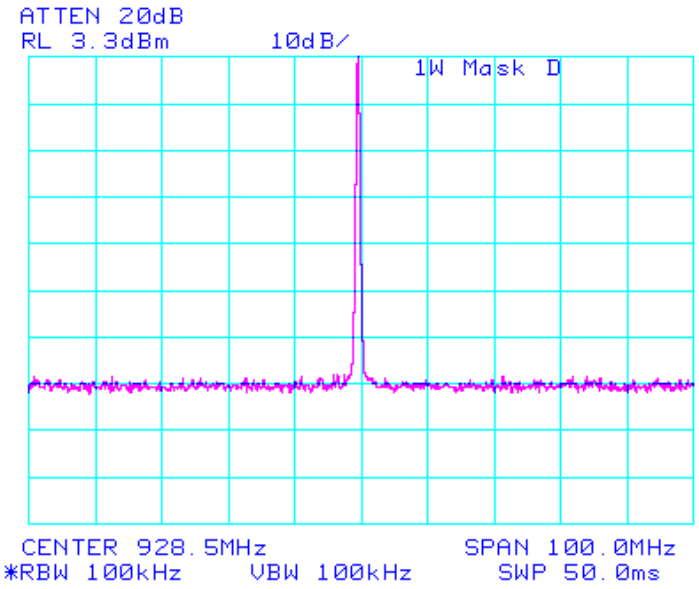
TEST SET-UP:

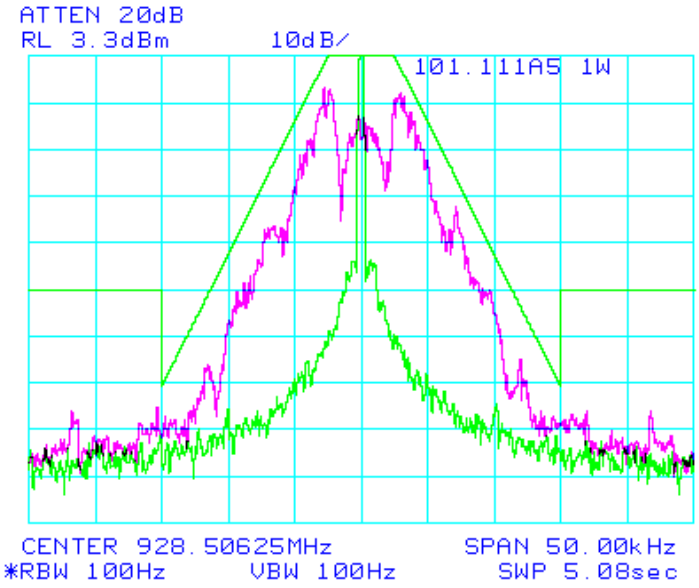


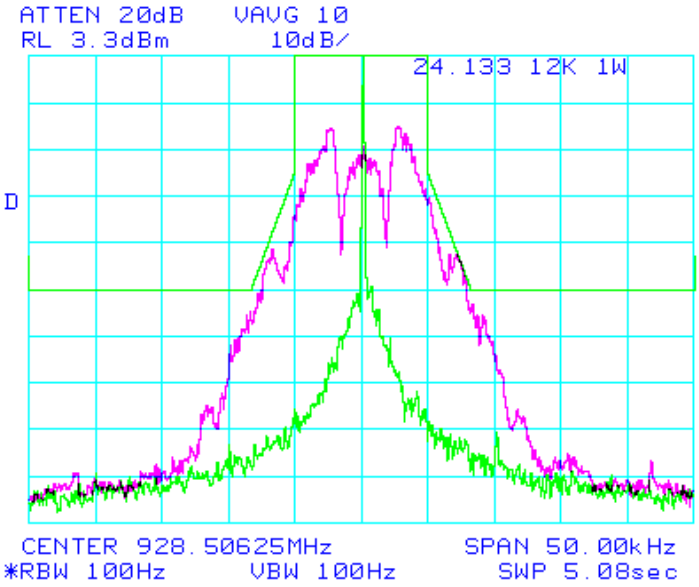
Mask: D
Output Power = 1 Watt

Spectrum for Emission: 9K55 F1D
Data Rate: 4800 bps  Peak Deviation with Data: 3.55 kHz

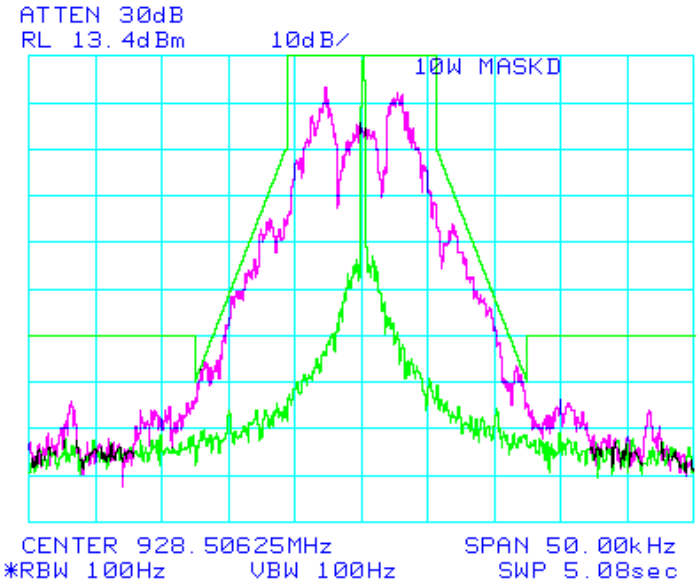


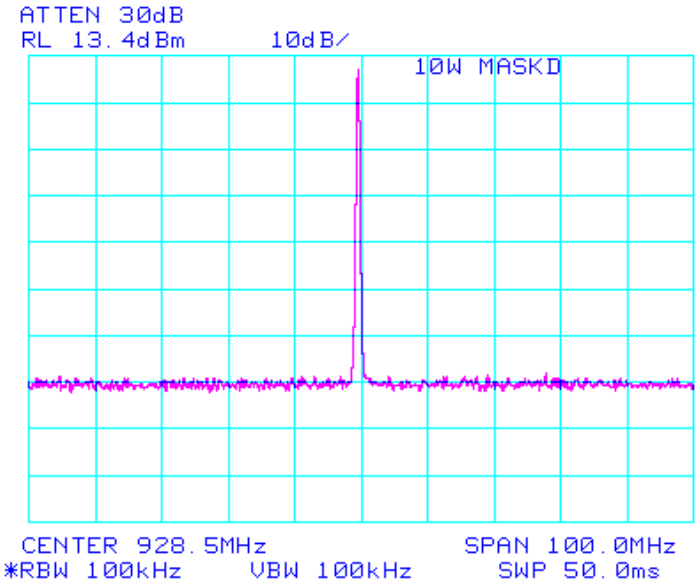



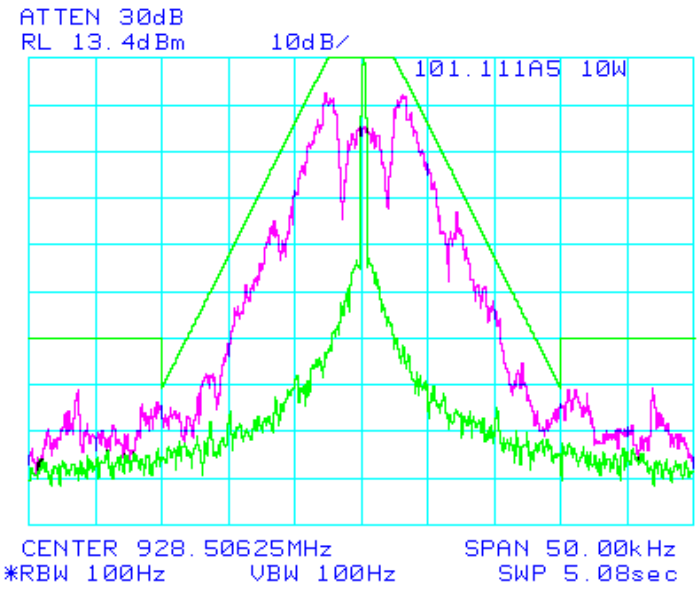

ATTEN 20dB
RL 3.3dBm
10dB/
101.111A5 1W
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec

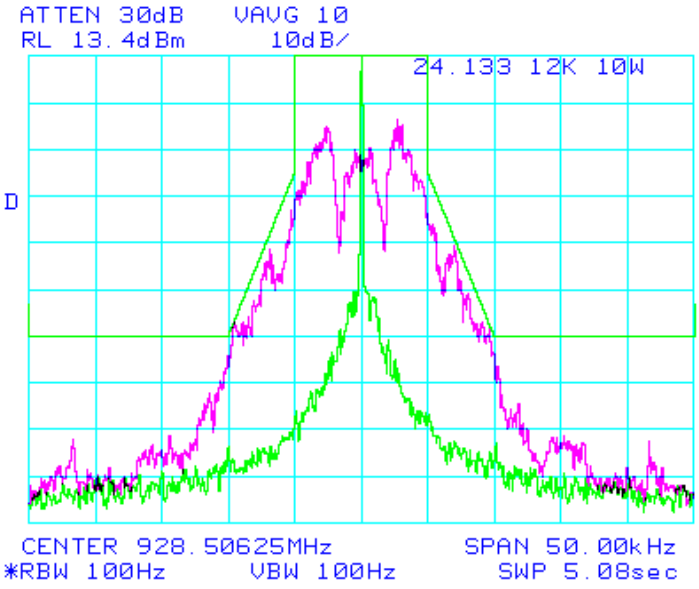

ATTEN 20dB
VAVG 10
RL 3.3dBm
10dB/
24.133 12K 1W
D
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec

Output Power = 10 Watts



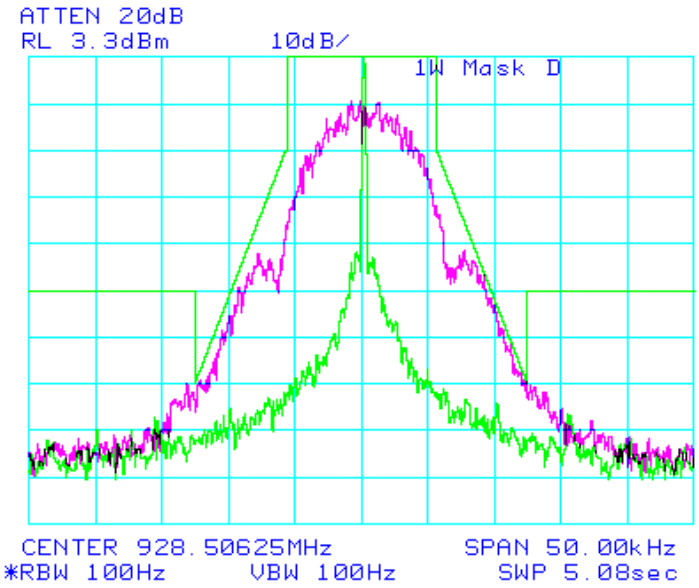



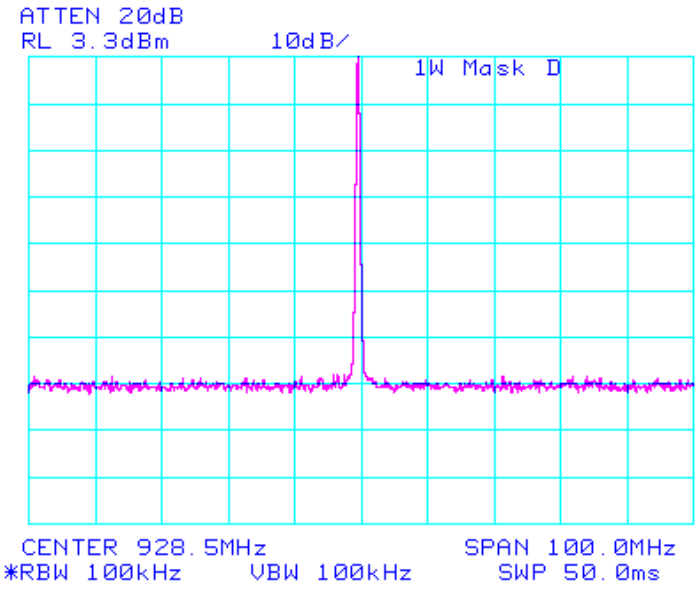

ATTEN 30dB
RL 13.4dBm
10dB/
101.111A5 10W
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec

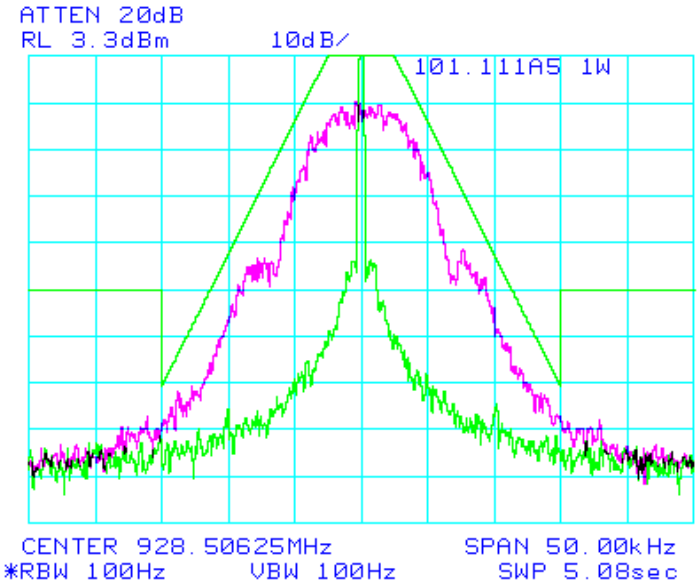

ATTEN 30dB
VAVG 10
RL 13.4dBm
10dB/
24.133 12K 10W
D
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec

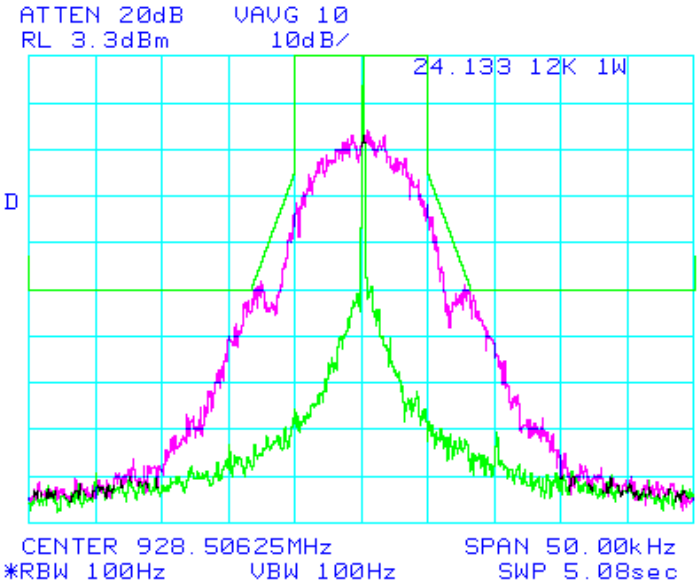
Mask: D
Output Power = 1 Watt

Spectrum for Emission: 9K35 F1D
Data Rate: 9600 bps  Peak Deviation with Data: 2.76 kHz

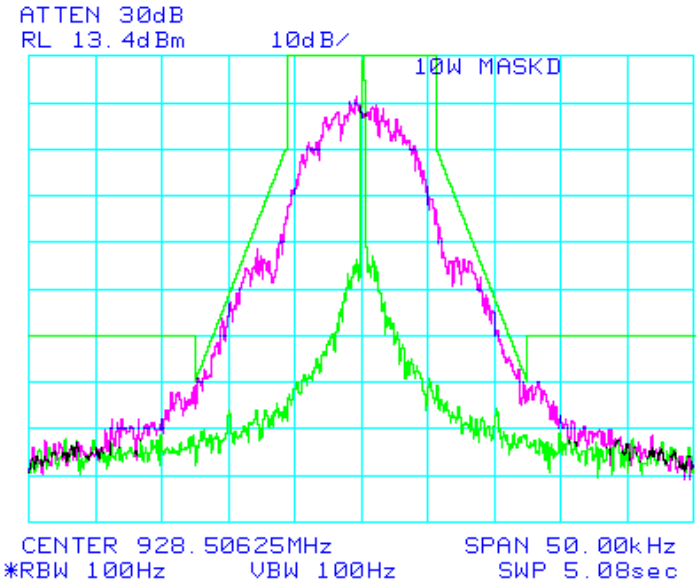


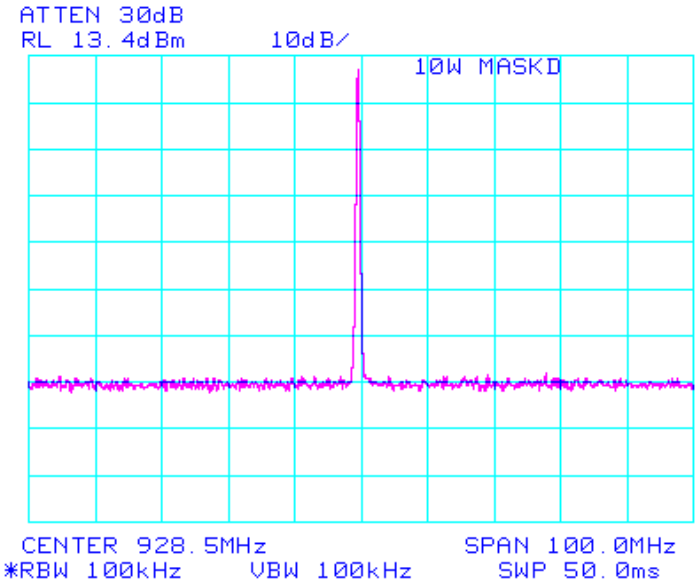



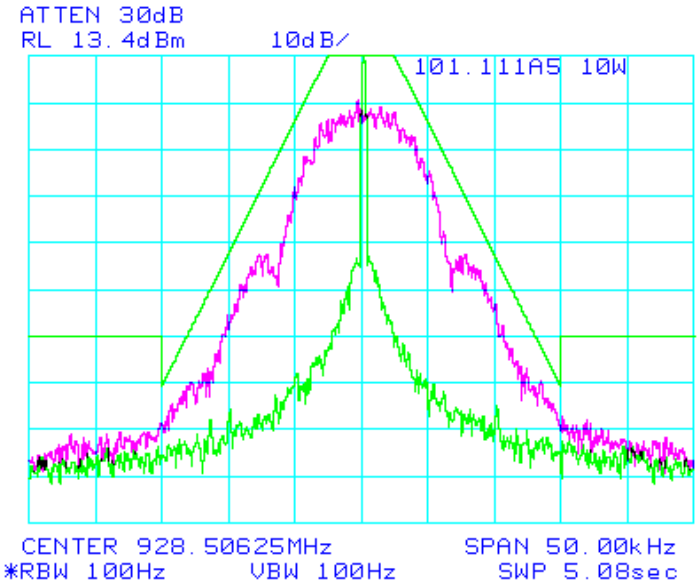

ATTEN 20dB
RL 3.3dBm
10dB/
101.111A5 1W
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec

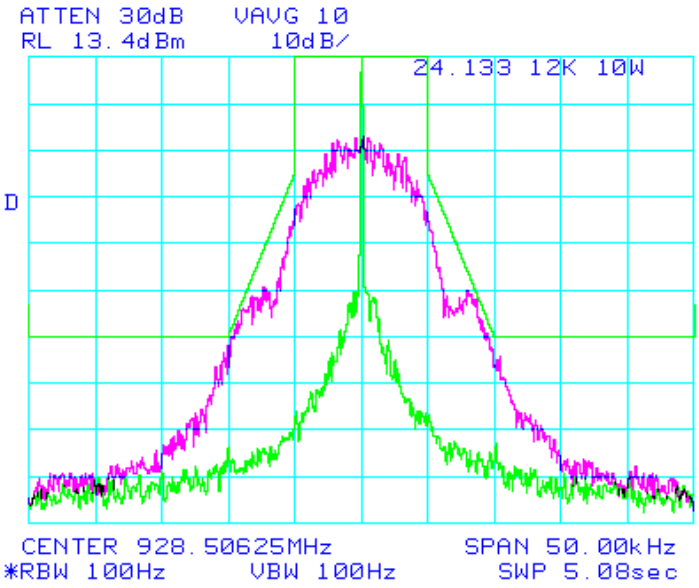

ATTEN 20dB
VAVG 10
RL 3.3dBm
10dB/
24.133 12K 1W
D
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec

Output Power = 10 Watts




ATTEN 30dB
RL 13.4dBm
10dB/
101.111A5 10W
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec


ATTEN 30dB
VAVG 10
RL 13.4dBm
10dB/
24.133 12K 10W
D
CENTER 928.50625MHz
SPAN 50.00kHz
*RBW 100Hz
VBW 100Hz
SWP 5.08sec

NAME OF TEST: Transmitter Mask Emission Limits for Emission Designators **11K6F1D, 14K6F1D and 16K4F1D**

RULE PART NUMBER: FCC: 2.202, 90.209 (b)(5), 90.210(g), 2.1049 (c) (1), 101.111 (a)(6) 24.133 (a)(1);

MINIMUM STANDARDS:

**Mask G**
Sidebands and Spurious [P = 10 Watts and P=1 Watt]
Authorized Bandwidth = 20 kHz
From Fo to 10 kHz, down 0 dB.
Greater than 10 kHz to 250% of authorized BW, at least
116 * $\log_{10}(f_d / 6.1)$ or 50 + 10 log (P) or 70 dB, whichever is the lesser attenuation [Greater than 10 kHz to 50 kHz for IC Mask G]
Greater than 250% of authorized BW, 43 + $10\log_{10}(P)$ [Greater than 50 kHz for IC Mask G]

Attenuation = 0 dB at Fo to 5 kHz
Attenuation = 25 dB at 10 kHz
Attenuation = 60 dB at 20.1 kHz
Attenuation = 60 dB at 62.5 kHz [@ 50 kHz for IC Mask]
Attenuation = 53.0 dB at frequencies greater than 62.5 kHz @ 10 W [greater than 50 kHz for IC Mask]
Attenuation = 43 dB at frequencies greater than 62.5 kHz @ 1 W [greater than 50 kHz for IC Mask]

**Mask 101.111(a)(6)**
Sidebands and Spurious [P = 10 Watts and P=1 Watt]
Authorized Bandwidth = 25 kHz
From Fo to 5.0 kHz, down 0 dB.
From 5 kHz to 10 kHz, down 83 * $\log_{10}(f_d / 5)$ dB
Greater than 10.0 kHz to 250% auth BW, down 116log(fd/6.1) or 50+10log(P) or 70 dB.
Greater then 250% auth BW, 43+$10\log_{10}(P)$ or 80 dB.

Attenuation = 0 db at Fo to 5 kHz
Attenuation = 25 dB at 10 kHz
Attenuation = 60 dB at 20.1 kHz @ 10W
Attenuation = 50 dB at 16.5 kHz @ 1W
Attenuation = 53 dB at > 62.5 kHz @ 10W or 43 dB @ 1W

**Mask 24.133(a)(1) 25 kHz**
Sidebands and Spurious [P = 10 Watts and P=1 Watt]
Authorized Bandwidth = 20 kHz
From Fo to 10 kHz, down 0 dB.
From 10 kHz to 50 kHz, down 116 * $\log_{10}(f_d + 10 / 6.1)$ dB, 50+10log(P) or 70 dB.
Greater than 50 kHz, 43+$10\log_{10}(P)$ or 80 dB.

Attenuation = 0 db at Fo to 10 kHz
Attenuation = 25 dB at 10 kHz
Attenuation = 60 dB at 20 kHz @ 10W
Attenuation = 50 dB at 16.45 kHz @ 1W
Attenuation = 53 dB at 50 kHz @ 10W
Attenuation = 43 dB at 50 kHz @ 1W

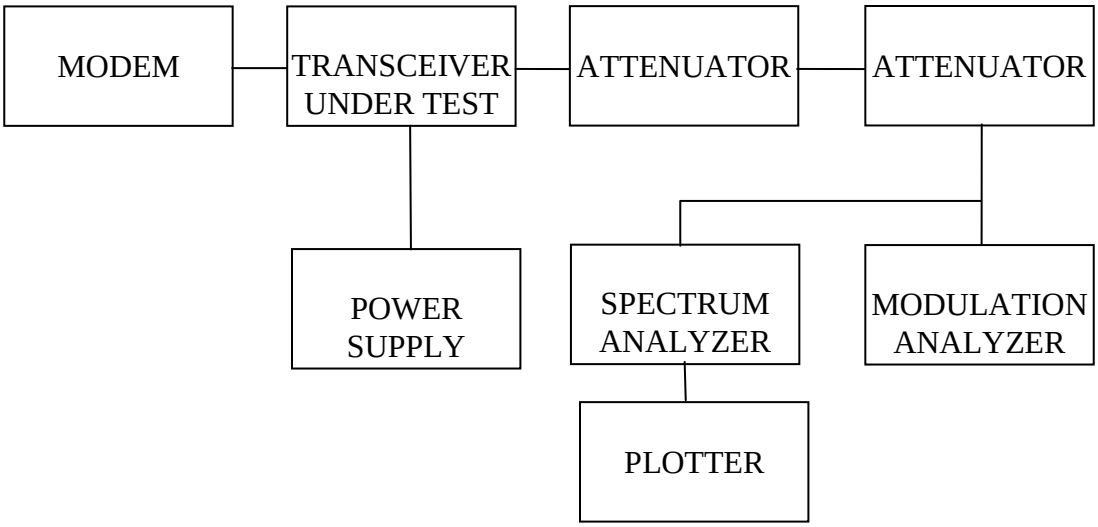
TEST RESULTS: Meets minimum standards (see data on following page)

TEST CONDITIONS: Standard Test Conditions, 25 C
RF Power Level = 1 Watt and 12 Watts
Voltage = 20VDC

TEST PROCEDURE: TIA/EIA – 603-C

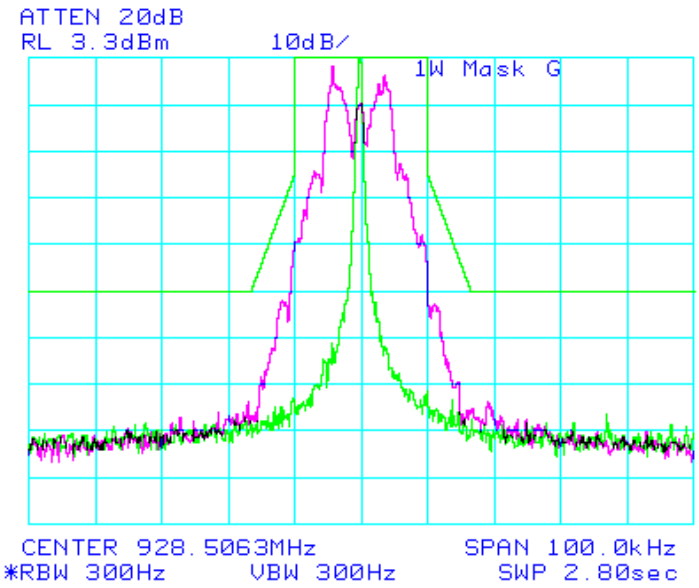
TEST EQUIPMENT: 50-Ohm Attenuator, Bird Electronics Model 25-A-MFN-20 (20dB, 25W)
50-Ohm Power Splitter, Mini Circuits Model ZFSC-3-4 (5.5dB IL at UHF)
DC Power Supply, Instek Model GPS-2303
Spectrum Analyzer, Hewlett Packard Model HP8563E
Modulation Analyzer, Hewlett Packard Model HP8901A

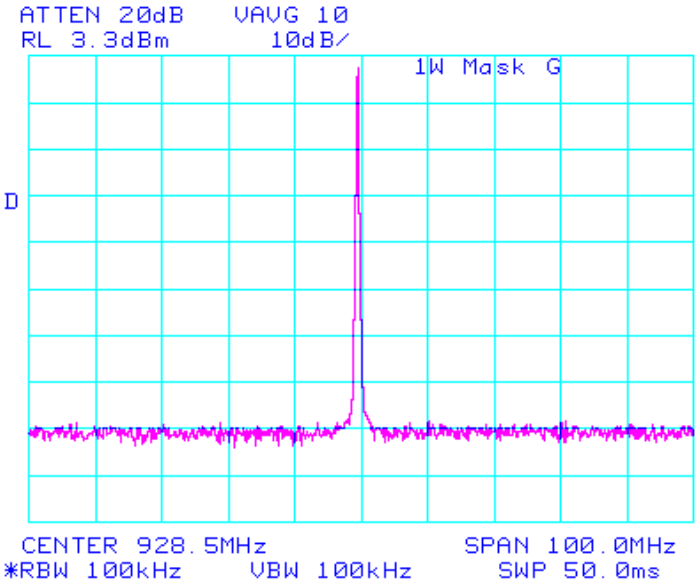
TEST SET-UP:

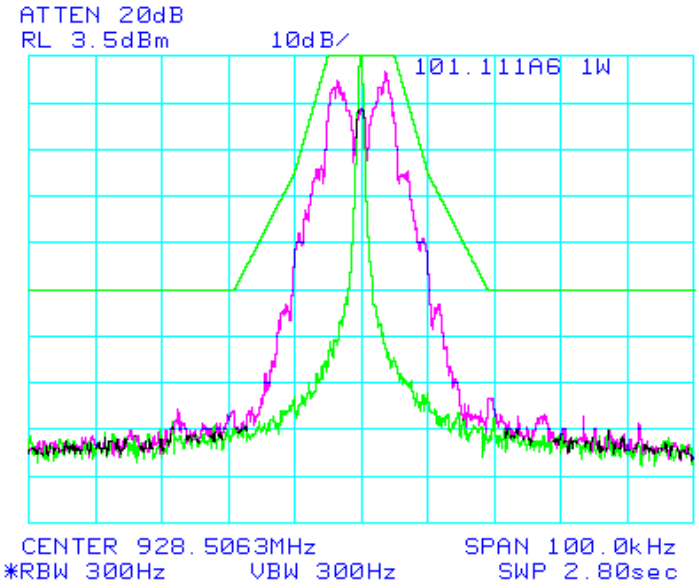


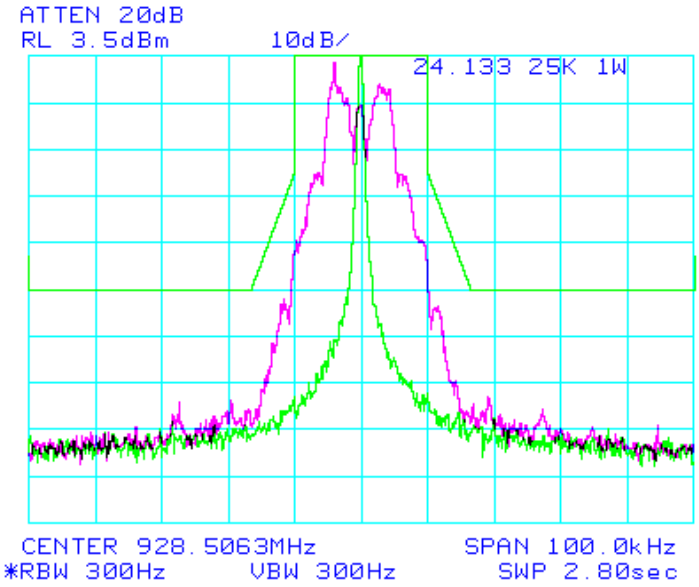
Mask: G
Output Power = 1 Watt

Spectrum for Emission: 11K6 F1D
Data Rate: 4800 bps Peak Deviation with Data: 4.43 kHz

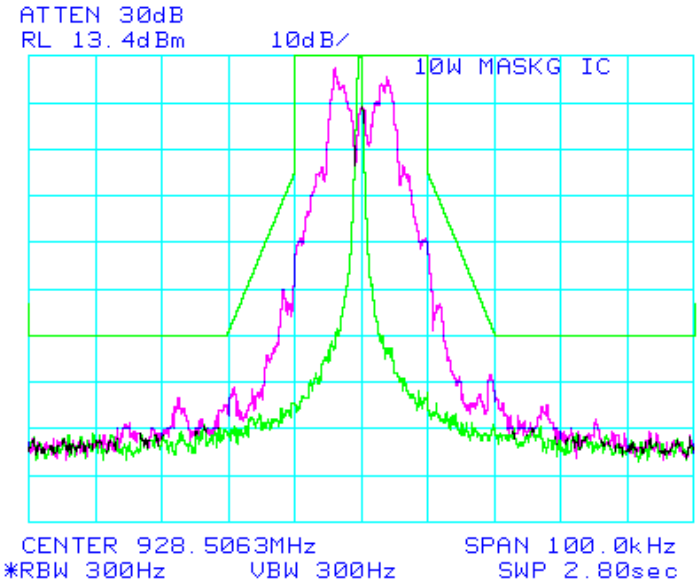


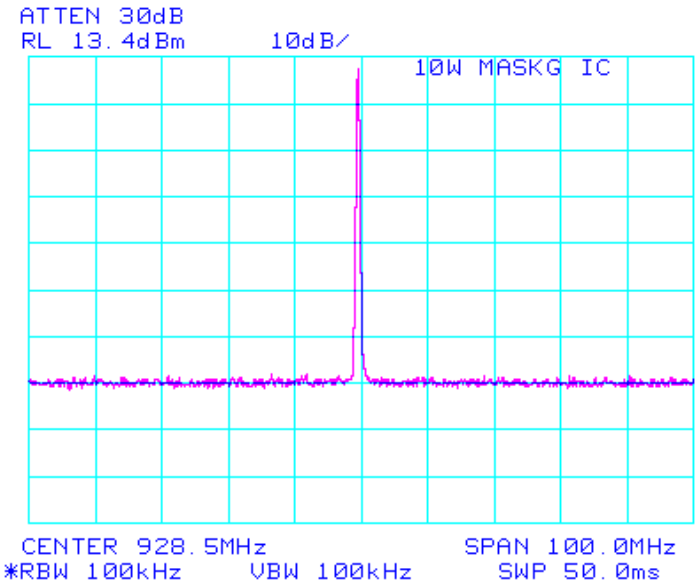



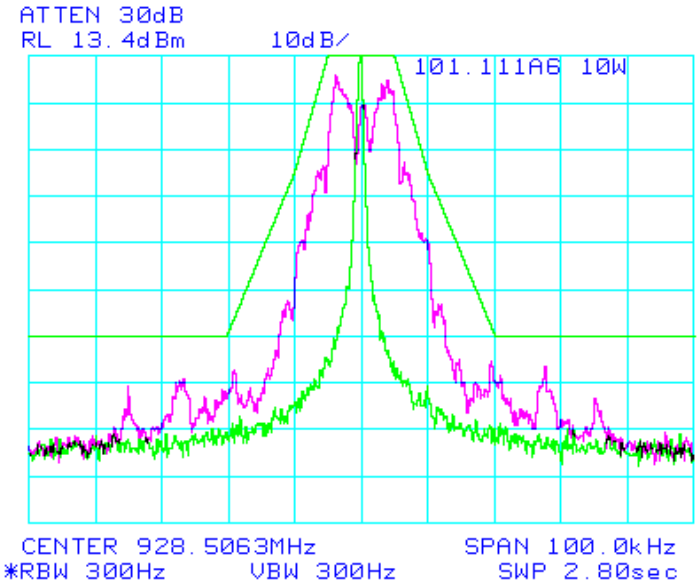

ATTEN 20dB
RL 3.5dBm
10dB/
101.111AB 1W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

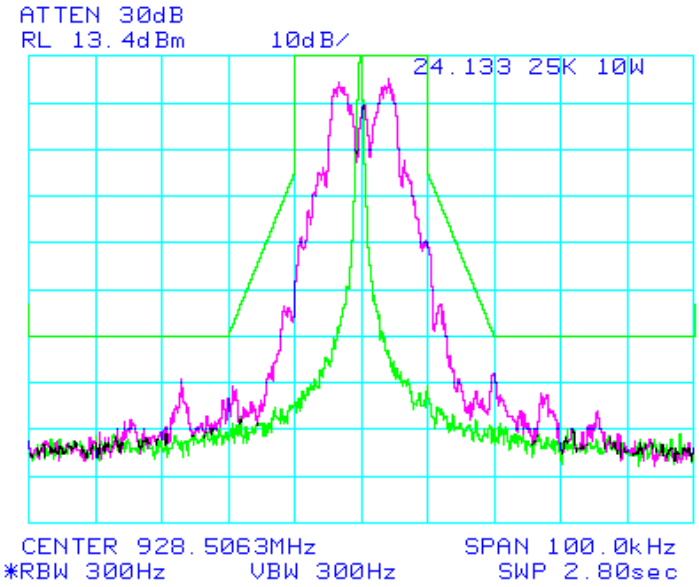

ATTEN 20dB
RL 3.5dBm
10dB/
24.133 25K 1W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

Output Power =10 Watts



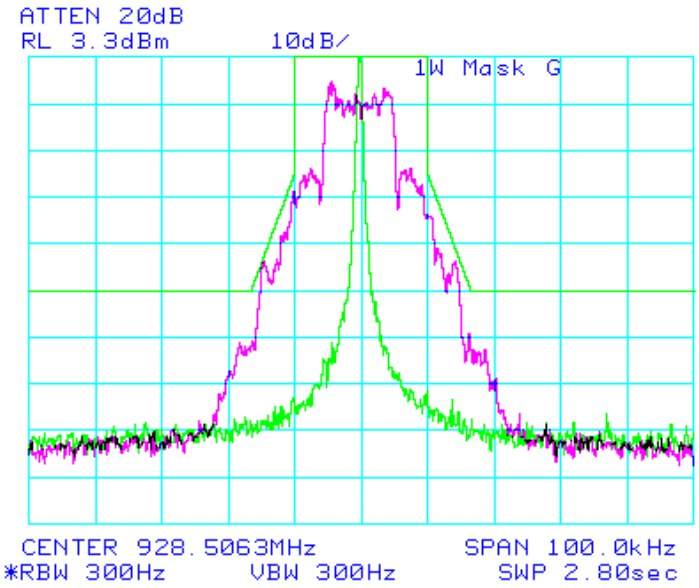



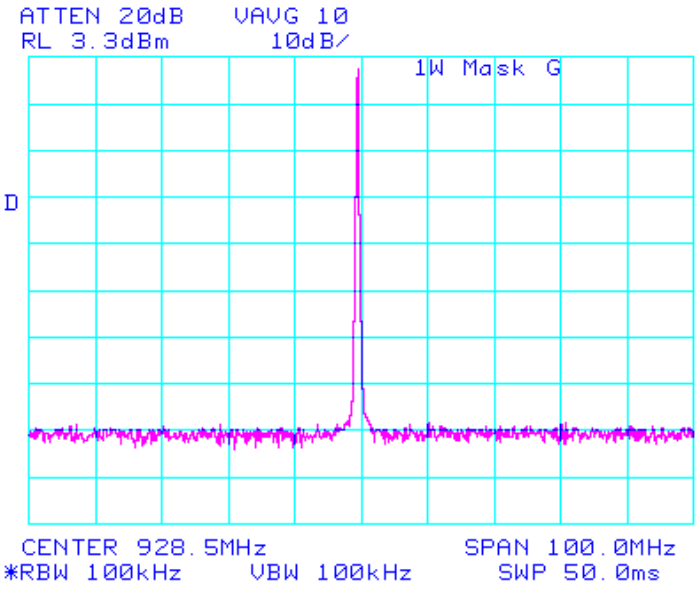

ATTEN 30dB
RL 13.4dBm
10dB/
101.111AB 10W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

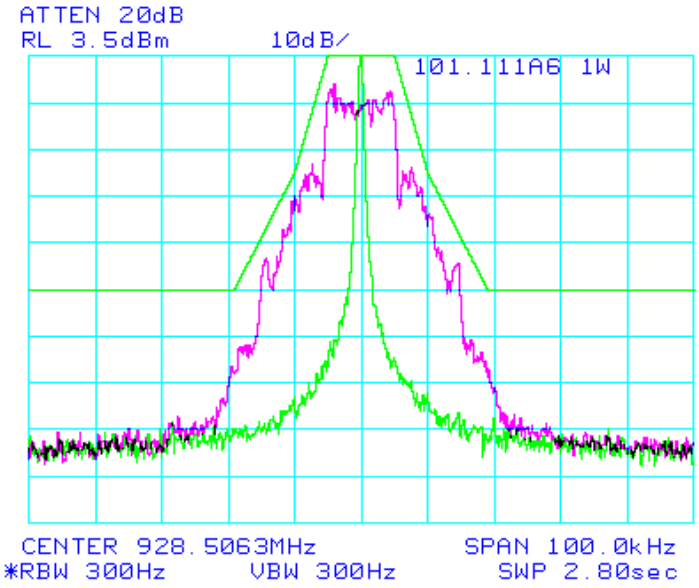

ATTEN 30dB
RL 13.4dBm
10dB/
24.133 25K 10W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

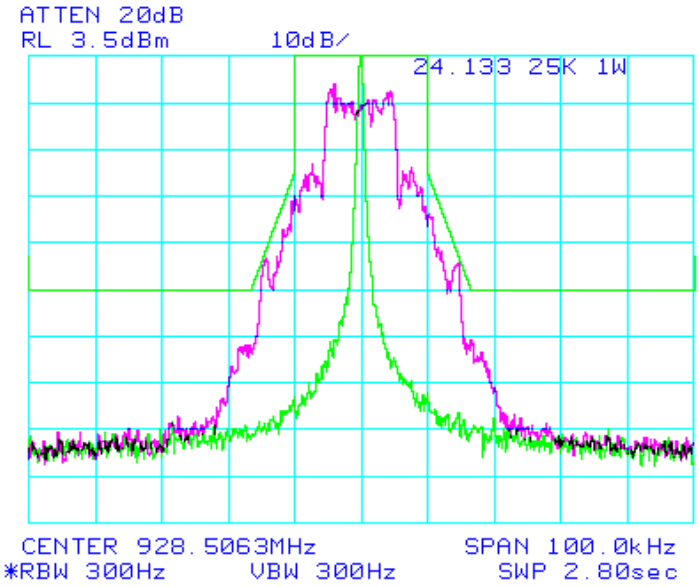
Mask: G
Output Power = 1 Watt

Spectrum for Emission: 14K6 F1D
Data Rate: 9600 bps Peak Deviation with Data: 4.40 kHz

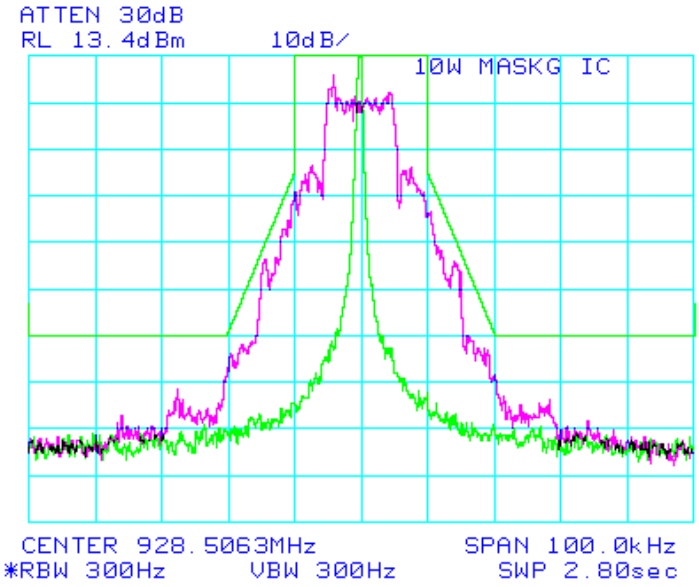


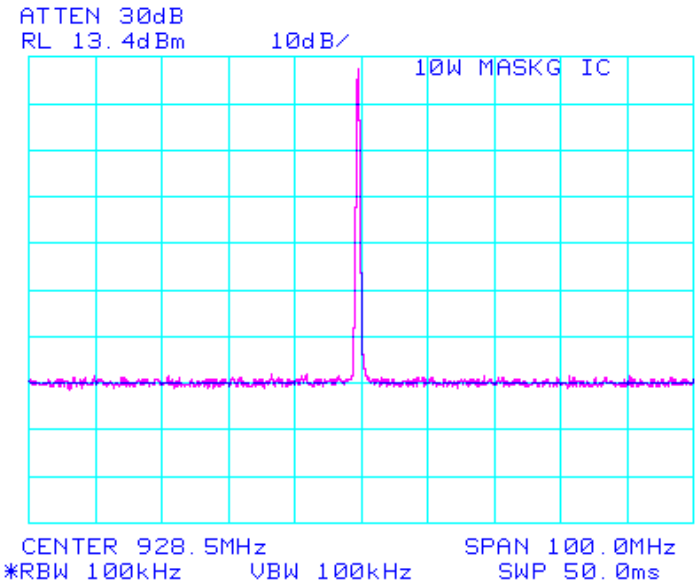



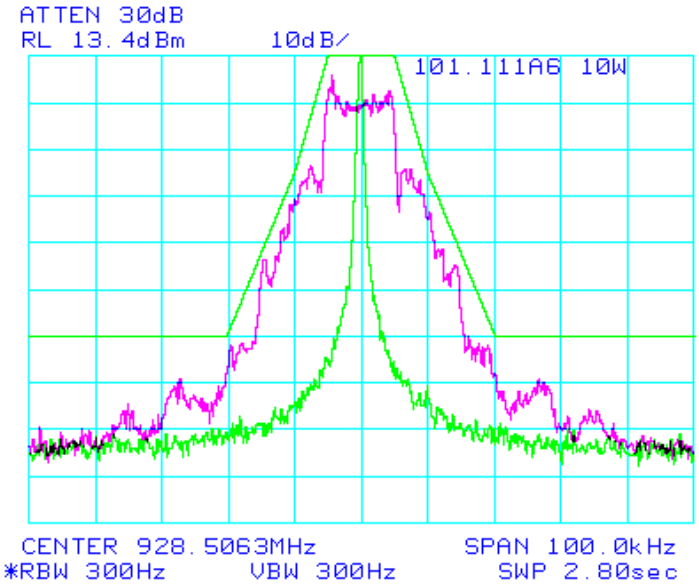

ATTEN 20dB
RL 3.5dBm
10dB/
101.111AB 1W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

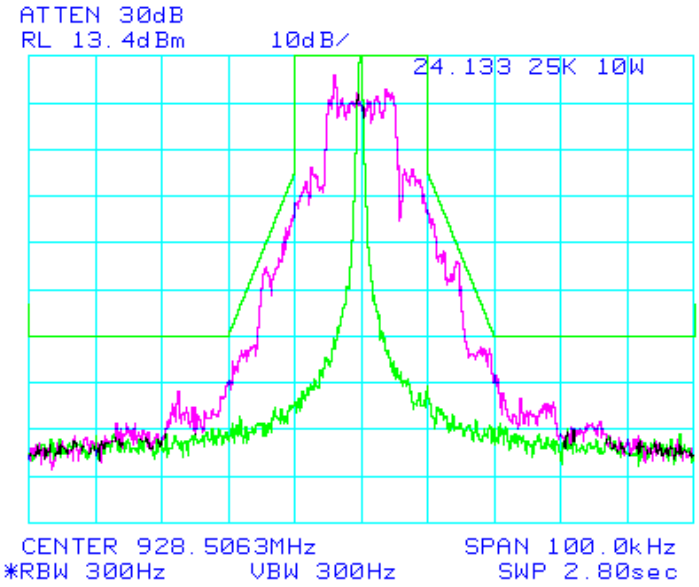

ATTEN 20dB
RL 3.5dBm
10dB/
24.133 25K 1W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

Output Power =10 Watts



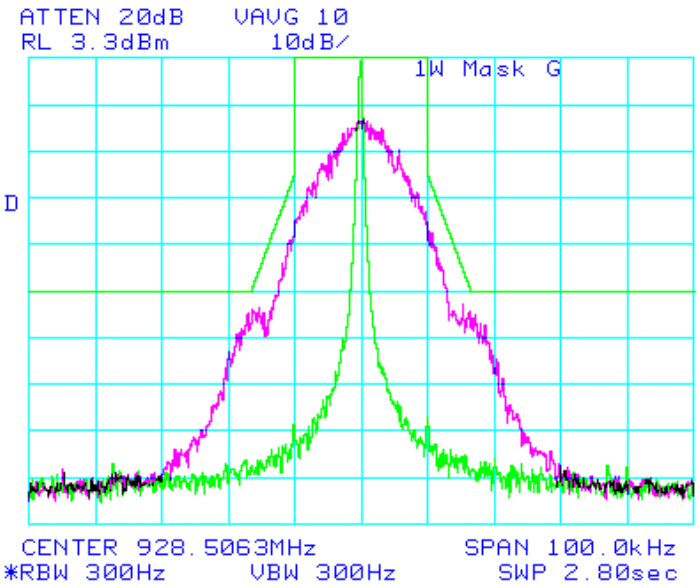



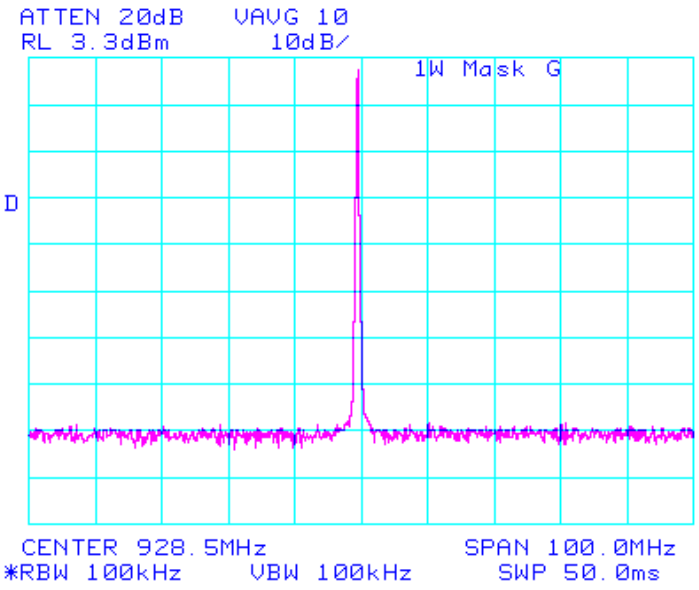

ATTEN 30dB
RL 13.4dBm
10dB/
101.111AB 10W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

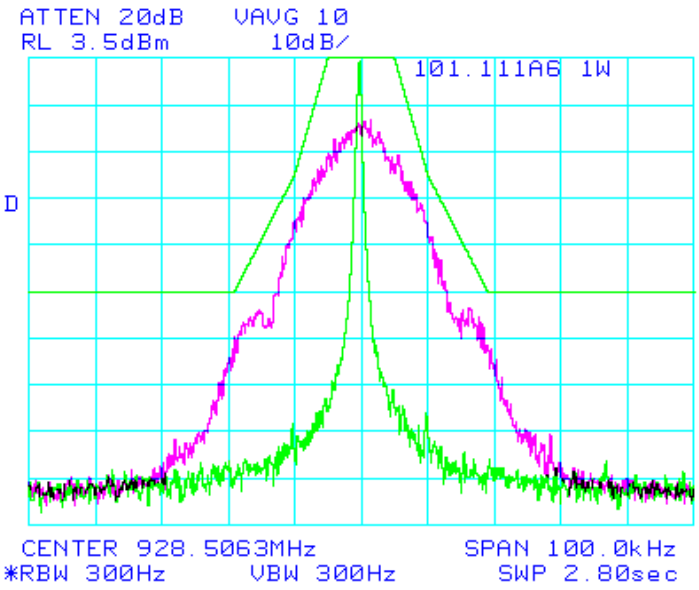

ATTEN 30dB
RL 13.4dBm
10dB/
24.133 25K 10W
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

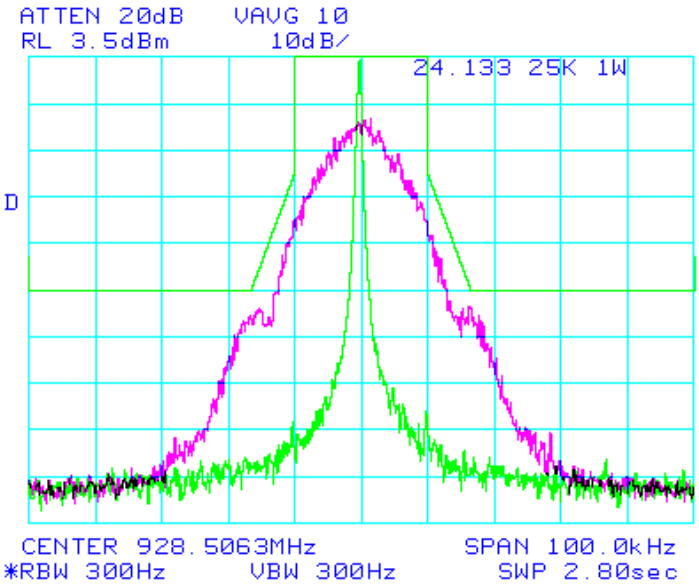
Mask: G
Output Power = 1 Watt

Spectrum for Emission: 16K4 F1D
Data Rate: 19200 bps  Peak Deviation with Data: 4.30 kHz

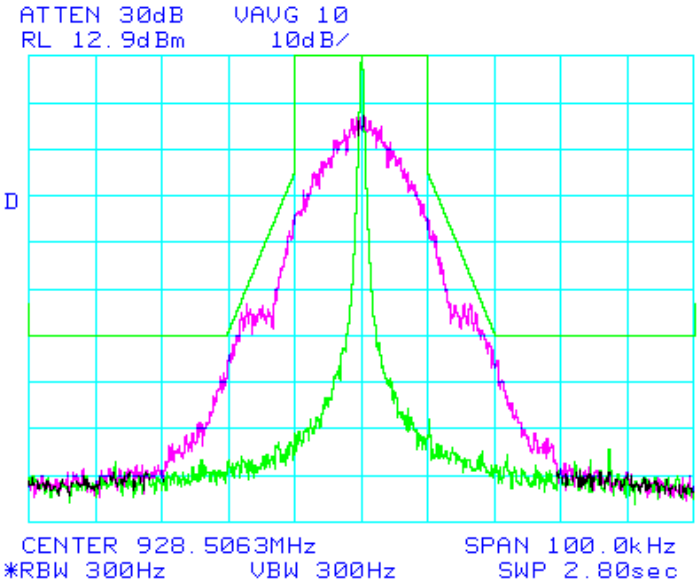


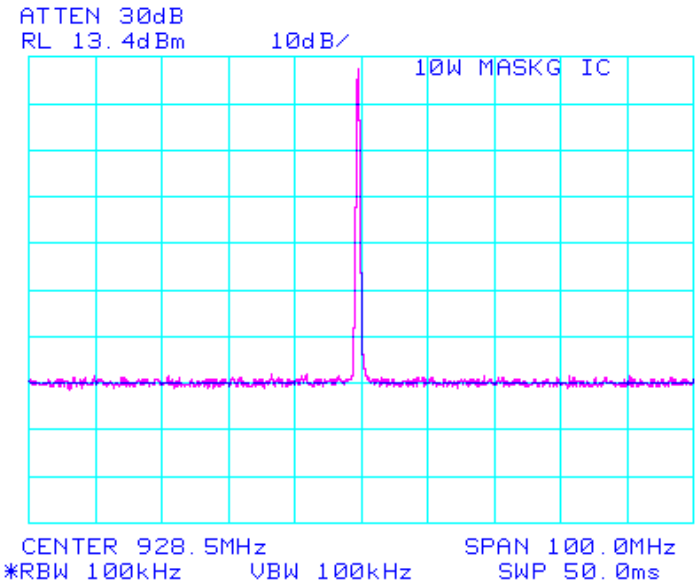



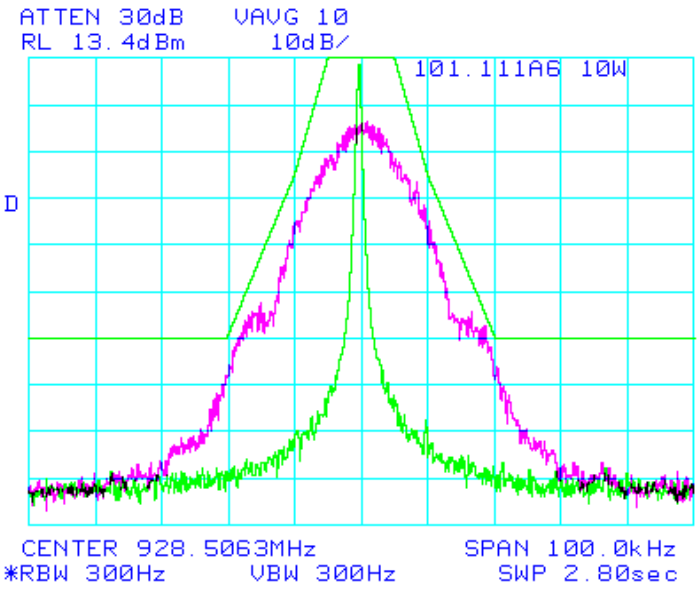

ATTEN 20dB
VAVG 10
RL 3.5dBm
10dB/
101.111AB 1W
D
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

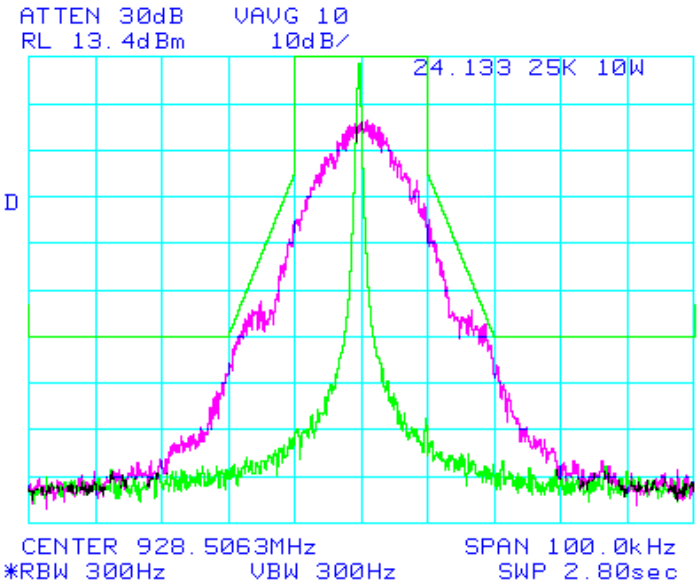

ATTEN 20dB
VAVG 10
RL 3.5dBm
10dB/
24.133 25K 1W
D
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

Output Power = 10 Watt




ATTEN 30dB
VAVG 10
RL 13.4dBm
10dB/
101.111AB 10W
D
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec


ATTEN 30dB
VAVG 10
RL 13.4dBm
10dB/
24.133 25K 10W
D
CENTER 928.5063MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

NAME OF TEST: Field Strength of Spurious Radiation

RULE PART NUMBER: FCC: 2.1053, 24.133, 90.210 (c,3)(d,3)(e,3), 101.111(a),22.359;

MINIMUM STANDARDS: For 12 Watts: $50+10\text{Log}_{10}(12\text{ Watts})$ = -60.8 dBc
or -70 dBc, whichever is the lesser attenuation.

For 1 Watt: $50+10\text{Log}_{10}(1\text{ Watt})$ = -50 dBc
or –70 dBc, whichever is the lesser attenuation.

TEST RESULTS: Meets minimum standards (see data on following page)

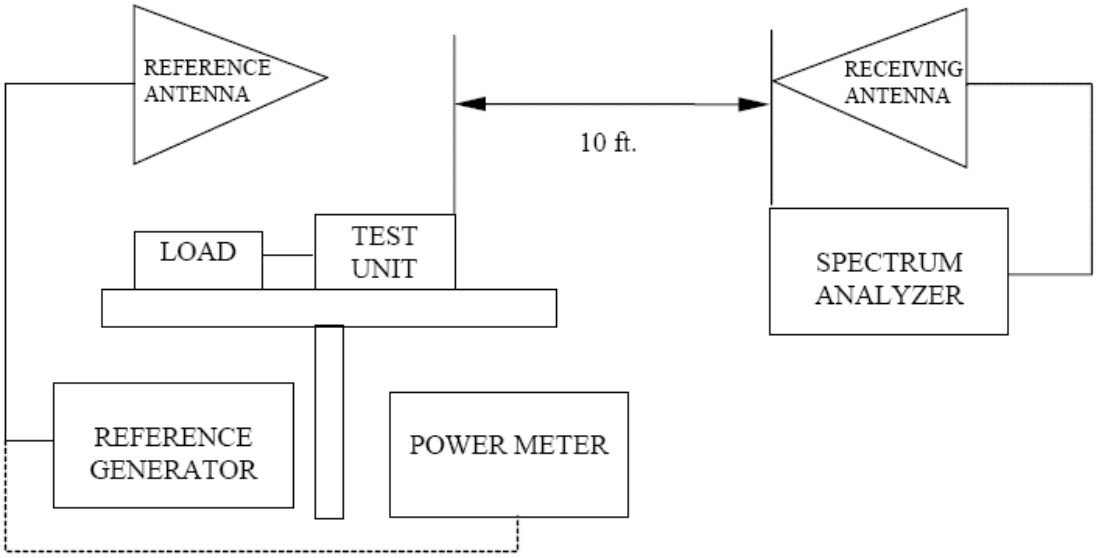
TEST CONDITIONS: Standard Test Conditions, 25 C
RF Power Level = 1 Watt and 12 Watts
Voltage = 20VDC

TEST PROCEDURE: TIA/EIA – 603-C

TEST EQUIPMENT: Waveguide Horn Antenna, EMCO Model 3115
Waveguide Horn Antenna, Electro-Metrics EM-6961
Bilog Antenna, Chase Model CBL6111B
Dipole Antenna, Electro-Metrics Model EM-6924
Power Supply, Model Instek GPS-3303
Spectrum Analyzer, Model HP-8563E
Reference Generator, Agilent Model E82570
Power Meter, Model HP 437B
50-Ohm Attenuator, Bird Electronics 50-A-FFN-20 (20dB, 50W)
50-Ohm Load, Lucas Weinschel 58-30-43
OATS 773B-1

MEASUREMENT PROCEDURE:
Measurements were made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier.

TEST SET-UP:



Half Duplex

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 928.025 | MHz | Spec = | -60.0 | -20.0 |
| Power: | 10 | Watts | Highest Spur = | -69.6 | -29.6 |
| | 40.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1856.05 | H | -84.0 | -40.8 | 5.33 | 0.67 | -85.5 | -45.5 |
| | V | -84.0 | -43.8 | 5.33 | 0.67 | -88.5 | -48.5 |
| 2784.075 | H | -90.3 | -42.5 | 7.00 | 1.00 | -88.5 | -48.5 |
| | V | -91.3 | -46.3 | 7.00 | 1.00 | -92.3 | -52.3 |
| 3712.1 | H | -89.2 | -33.6 | 9.83 | 1.50 | -82.0 | -42.0 |
| | V | -83.8 | -31.3 | 9.83 | 1.50 | -79.6 | -39.6 |
| 4640.125 | H | -83.0 | -26.6 | 11.50 | 1.67 | -76.5 | -36.5 |
| | V | -84.8 | -28.5 | 11.50 | 1.67 | -78.3 | -38.3 |
| 5568.15 | H | -96.0 | -35.0 | 12.67 | 2.33 | -85.3 | -45.3 |
| | V | -94.5 | -33.5 | 12.67 | 2.33 | -83.8 | -43.8 |
| 6496.175 | H | -92.0 | -28.0 | 14.67 | 2.33 | -80.3 | -40.3 |
| | V | -89.5 | -24.8 | 14.67 | 2.33 | -77.1 | -37.1 |
| 7424.2 | H | -104.8 | -33.9 | 16.83 | 3.83 | -86.9 | -46.9 |
| | V | -95.7 | -21.8 | 16.83 | 3.83 | -74.8 | -34.8 |
| 8352.225 | H | -103.2 | -28.3 | 18.50 | 3.33 | -83.5 | -43.5 |
| | V | -98.3 | -14.5 | 18.50 | 3.33 | -69.6 | -29.6 |
| 9280.25 | H | -110.3 | -26.4 | 21.83 | 4.67 | -83.6 | -43.6 |
| | V | -110.3 | -22.1 | 21.83 | 4.67 | -79.3 | -39.3 |

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 928.025 | MHz | Spec = | -50.0 | -20.0 |
| Power: | 1 | Watts | Highest Spur = | -67.6 | -37.6 |
| | 30.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1856.05 | H | -93.8 | -50.6 | 5.33 | 0.67 | -85.3 | -55.3 |
| | V | -96.2 | -56.0 | 5.33 | 0.67 | -90.6 | -60.6 |
| 2784.075 | H | -95.0 | -47.1 | 7.00 | 1.00 | -83.1 | -53.1 |
| | V | -94.2 | -49.1 | 7.00 | 1.00 | -85.1 | -55.1 |
| 3712.1 | H | -105.1 | -49.6 | 9.83 | 1.50 | -87.9 | -57.9 |
| | V | -105.3 | -52.8 | 9.83 | 1.50 | -91.1 | -61.1 |
| 4640.125 | H | -91.7 | -35.3 | 11.50 | 1.67 | -75.1 | -45.1 |
| | V | -91.3 | -35.0 | 11.50 | 1.67 | -74.8 | -44.8 |
| 5568.15 | H | -95.0 | -34.0 | 12.67 | 2.33 | -74.3 | -44.3 |
| | V | -93.7 | -32.6 | 12.67 | 2.33 | -73.0 | -43.0 |
| 6496.175 | H | -104.3 | -40.3 | 14.67 | 2.33 | -82.6 | -52.6 |
| | V | -100.8 | -36.1 | 14.67 | 2.33 | -78.4 | -48.4 |
| 7424.2 | H | -110.8 | -39.9 | 16.83 | 3.83 | -82.9 | -52.9 |
| | V | -104.0 | -30.1 | 16.83 | 3.83 | -73.1 | -43.1 |
| 8352.225 | H | -109.3 | -34.4 | 18.50 | 3.33 | -79.6 | -49.6 |
| | V | -106.3 | -22.4 | 18.50 | 3.33 | -67.6 | -37.6 |
| 9280.25 | H | -112.8 | -28.9 | 21.83 | 4.67 | -76.1 | -46.1 |
| | V | -112.3 | -24.1 | 21.83 | 4.67 | -71.3 | -41.3 |

Half Duplex

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 944.1 | MHz | Spec = | -60.0 | -20.0 |
| Power: | 10 | Watts | Highest Spur = | -73.0 | -33.0 |
| | 40.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1888.2 | H | -89.7 | -45.5 | 5.33 | 0.67 | -90.1 | -50.1 |
| | V | -97.2 | -56.3 | 5.33 | 0.67 | -101.0 | -61.0 |
| 2832.3 | H | -93.3 | -47.3 | 7.17 | 1.00 | -93.5 | -53.5 |
| | V | -97.3 | -52.6 | 7.17 | 1.00 | -98.8 | -58.8 |
| 3776.4 | H | -92.2 | -38.6 | 9.50 | 1.50 | -86.6 | -46.6 |
| | V | -90.7 | -38.3 | 9.50 | 1.50 | -86.3 | -46.3 |
| 4720.5 | H | -82.7 | -26.0 | 11.67 | 2.33 | -75.3 | -35.3 |
| | V | -82.5 | -26.0 | 11.67 | 2.33 | -75.3 | -35.3 |
| 5664.6 | H | -95.3 | -33.1 | 12.83 | 2.33 | -83.6 | -43.6 |
| | V | -91.5 | -29.3 | 12.83 | 2.33 | -79.8 | -39.8 |
| 6608.7 | H | -86.8 | -21.3 | 15.17 | 2.33 | -74.1 | -34.1 |
| | V | -85.8 | -20.1 | 15.17 | 2.33 | -73.0 | -33.0 |
| 7552.8 | H | -108.8 | -39.9 | 16.33 | 3.17 | -93.1 | -53.1 |
| | V | -101.0 | -31.0 | 16.33 | 3.17 | -84.1 | -44.1 |
| 8496.9 | H | -105.2 | -29.2 | 19.00 | 3.67 | -84.5 | -44.5 |
| | V | -99.0 | -20.6 | 19.00 | 3.67 | -76.0 | -36.0 |
| 9441 | H | -112.3 | -26.1 | 22.67 | 4.67 | -84.1 | -44.1 |
| | V | -103.7 | -19.7 | 22.67 | 4.67 | -77.7 | -37.7 |

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 944.1 | MHz | Spec = | -50.0 | -20.0 |
| Power: | 1 | Watts | Highest Spur = | -73.5 | -43.5 |
| | 30.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1888.2 | H | -98.0 | -53.8 | 5.33 | 0.67 | -88.5 | -58.5 |
| | V | -96.5 | -55.6 | 5.33 | 0.67 | -90.3 | -60.3 |
| 2832.3 | H | -95.2 | -49.1 | 7.17 | 1.00 | -85.3 | -55.3 |
| | V | -98.2 | -53.5 | 7.17 | 1.00 | -89.6 | -59.6 |
| 3776.4 | H | -99.7 | -46.1 | 9.50 | 1.50 | -84.1 | -54.1 |
| | V | -98.0 | -45.6 | 9.50 | 1.50 | -83.6 | -53.6 |
| 4720.5 | H | -91.8 | -35.1 | 11.67 | 2.33 | -74.5 | -44.5 |
| | V | -91.8 | -35.3 | 11.67 | 2.33 | -74.6 | -44.6 |
| 5664.6 | H | -98.2 | -36.0 | 12.83 | 2.33 | -76.5 | -46.5 |
| | V | -100.5 | -38.3 | 12.83 | 2.33 | -78.8 | -48.8 |
| 6608.7 | H | -98.3 | -32.8 | 15.17 | 2.33 | -75.6 | -45.6 |
| | V | -97.8 | -32.1 | 15.17 | 2.33 | -75.0 | -45.0 |
| 7552.8 | H | -110.0 | -41.1 | 16.33 | 3.17 | -84.3 | -54.3 |
| | V | -108.0 | -38.0 | 16.33 | 3.17 | -81.1 | -51.1 |
| 8496.9 | H | -112.3 | -36.3 | 19.00 | 3.67 | -81.6 | -51.6 |
| | V | -110.8 | -32.4 | 19.00 | 3.67 | -77.8 | -47.8 |
| 9441 | H | -111.7 | -25.5 | 22.67 | 4.67 | -73.5 | -43.5 |
| | V | -111.2 | -27.2 | 22.67 | 4.67 | -75.2 | -45.2 |

Half Duplex

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 959.975 | MHz | Spec = | -60.0 | -20.0 |
| Power: | 10 | Watts | Highest Spur = | -62.4 | -22.4 |
| | 40.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1919.95 | H | -90.2 | -46.3 | 5.50 | 4.85 | -87.0 | -47.0 |
| | V | -92.5 | -50.5 | 5.50 | 4.85 | -91.1 | -51.1 |
| 2879.925 | H | -93.5 | -48.3 | 7.17 | 5.65 | -89.8 | -49.8 |
| | V | -93.3 | -46.8 | 7.17 | 5.65 | -88.3 | -48.3 |
| 3839.9 | H | -84.0 | -32.6 | 9.83 | 5.95 | -76.5 | -36.5 |
| | V | -84.3 | -29.5 | 9.83 | 5.95 | -73.3 | -33.3 |
| 4799.875 | H | -80.2 | -23.5 | 12.00 | 7.05 | -68.4 | -28.4 |
| | V | -75.8 | -17.5 | 12.00 | 7.05 | -62.4 | -22.4 |
| 5759.85 | H | -83.3 | -22.0 | 13.00 | 6.85 | -68.1 | -28.1 |
| | V | -86.3 | -23.8 | 13.00 | 6.85 | -70.0 | -30.0 |
| 6719.825 | H | -87.8 | -22.3 | 15.00 | 7.95 | -69.4 | -29.4 |
| | V | -85.7 | -19.1 | 15.00 | 7.95 | -66.2 | -26.2 |
| 7679.8 | H | -100.2 | -30.0 | 17.00 | 7.45 | -79.6 | -39.6 |
| | V | -99.7 | -28.3 | 17.00 | 7.45 | -77.9 | -37.9 |
| 8639.775 | H | -99.5 | -21.6 | 20.17 | 7.65 | -74.2 | -34.2 |
| | V | -92.0 | -14.6 | 20.17 | 7.65 | -67.2 | -27.2 |
| 9599.75 | H | -108.7 | -21.3 | 23.33 | 8.00 | -76.7 | -36.7 |
| | V | -102.0 | -14.6 | 23.33 | 8.00 | -70.0 | -30.0 |

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 959.975 | MHz | Spec = | -50.0 | -20.0 |
| Power: | 1 | Watts | Highest Spur = | -65.9 | -35.9 |
| | 30.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1919.95 | H | -97.5 | -53.6 | 5.50 | 4.85 | -84.3 | -54.3 |
| | V | -99.7 | -57.6 | 5.50 | 4.85 | -88.3 | -58.3 |
| 2879.925 | H | -95.0 | -49.8 | 7.17 | 5.65 | -81.3 | -51.3 |
| | V | -93.0 | -46.5 | 7.17 | 5.65 | -78.0 | -48.0 |
| 3839.9 | H | -103.3 | -51.9 | 9.83 | 5.95 | -85.8 | -55.8 |
| | V | -100.2 | -45.3 | 9.83 | 5.95 | -79.2 | -49.2 |
| 4799.875 | H | -93.0 | -36.3 | 12.00 | 7.05 | -71.3 | -41.3 |
| | V | -89.3 | -31.0 | 12.00 | 7.05 | -65.9 | -35.9 |
| 5759.85 | H | -96.7 | -35.3 | 13.00 | 6.85 | -71.5 | -41.5 |
| | V | -100.7 | -38.2 | 13.00 | 6.85 | -74.3 | -44.3 |
| 6719.825 | H | -99.3 | -33.8 | 15.00 | 7.95 | -70.9 | -40.9 |
| | V | -96.8 | -30.3 | 15.00 | 7.95 | -67.4 | -37.4 |
| 7679.8 | H | -106.7 | -36.5 | 17.00 | 7.45 | -76.1 | -46.1 |
| | V | -100.7 | -29.3 | 17.00 | 7.45 | -68.9 | -38.9 |
| 8639.775 | H | -116.0 | -38.1 | 20.17 | 7.65 | -80.7 | -50.7 |
| | V | -115.2 | -37.8 | 20.17 | 7.65 | -80.4 | -50.4 |
| 9599.75 | H | -116.0 | -28.6 | 23.33 | 8.00 | -74.0 | -44.0 |
| | V | -110.7 | -23.3 | 23.33 | 8.00 | -68.7 | -38.7 |

Half Duplex

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 944.1 | MHz | Spec = | -60.0 | -20.0 |
| Power: | 10 | Watts | Highest Spur = | -67.2 | -27.2 |
| | 40.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1888.2 | H | -93.0 | -48.8 | 5.33 | 0.67 | -93.5 | -53.5 |
| | V | -95.8 | -54.9 | 5.33 | 0.67 | -99.6 | -59.6 |
| 2832.3 | H | -96.2 | -50.2 | 7.17 | 1.00 | -96.3 | -56.3 |
| | V | -96.2 | -51.5 | 7.17 | 1.00 | -97.7 | -57.7 |
| 3776.4 | H | -106.0 | -52.5 | 9.50 | 1.50 | -100.5 | -60.5 |
| | V | -97.3 | -44.9 | 9.50 | 1.50 | -92.9 | -52.9 |
| 4720.5 | H | -84.0 | -27.3 | 11.67 | 2.33 | -76.6 | -36.6 |
| | V | -83.0 | -26.5 | 11.67 | 2.33 | -75.8 | -35.8 |
| 5664.6 | H | -96.5 | -34.3 | 12.83 | 2.33 | -84.8 | -44.8 |
| | V | -95.7 | -33.5 | 12.83 | 2.33 | -84.0 | -44.0 |
| 6608.7 | H | -98.5 | -33.0 | 15.17 | 2.33 | -85.8 | -45.8 |
| | V | -91.7 | -26.0 | 15.17 | 2.33 | -78.8 | -38.8 |
| 7552.8 | H | -101.8 | -32.9 | 16.33 | 3.17 | -86.1 | -46.1 |
| | V | -105.0 | -35.0 | 16.33 | 3.17 | -88.1 | -48.1 |
| 8496.9 | H | -97.7 | -21.7 | 19.00 | 3.67 | -77.0 | -37.0 |
| | V | -90.2 | -11.8 | 19.00 | 3.67 | -67.2 | -27.2 |
| 9441 | H | -107.2 | -21.0 | 22.67 | 4.67 | -79.0 | -39.0 |
| | V | -106.0 | -22.0 | 22.67 | 4.67 | -80.0 | -40.0 |

| | | | | | |
|---|---|---|---|---|---|
| Freqency: | 944.1 | MHz | Spec = | -50.0 | -20.0 |
| Power: | 1 | Watts | Highest Spur = | -71.2 | -41.2 |
| | 30.0 | dBm | | | |

| Spurious Frequency (MHz) | Polarization (Horz/Vert) | Spurious Level (dBm) | Substitution Generator (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Spurious Attenuation dBc | Spurious Attenuation dBm |
|---|---|---|---|---|---|---|---|
| 1888.2 | H | -100.0 | -55.8 | 5.33 | 0.67 | -90.5 | -60.5 |
| | V | -98.8 | -58.0 | 5.33 | 0.67 | -92.6 | -62.6 |
| 2832.3 | H | -96.3 | -50.3 | 7.17 | 1.00 | -86.4 | -56.4 |
| | V | -96.1 | -51.4 | 7.17 | 1.00 | -87.6 | -57.6 |
| 3776.4 | H | -110.5 | -57.0 | 9.50 | 1.50 | -95.0 | -65.0 |
| | V | -101.0 | -48.6 | 9.50 | 1.50 | -86.6 | -56.6 |
| 4720.5 | H | -94.8 | -38.1 | 11.67 | 2.33 | -77.5 | -47.5 |
| | V | -91.8 | -35.3 | 11.67 | 2.33 | -74.6 | -44.6 |
| 5664.6 | H | -104.8 | -42.6 | 12.83 | 2.33 | -83.1 | -53.1 |
| | V | -105.3 | -43.1 | 12.83 | 2.33 | -83.6 | -53.6 |
| 6608.7 | H | -109.7 | -44.2 | 15.17 | 2.33 | -87.0 | -57.0 |
| | V | -104.0 | -38.3 | 15.17 | 2.33 | -81.1 | -51.1 |
| 7552.8 | H | -110.8 | -41.9 | 16.33 | 3.17 | -85.1 | -55.1 |
| | V | -108.0 | -38.0 | 16.33 | 3.17 | -81.1 | -51.1 |
| 8496.9 | H | -111.0 | -35.0 | 19.00 | 3.67 | -80.3 | -50.3 |
| | V | -104.2 | -25.8 | 19.00 | 3.67 | -71.2 | -41.2 |
| 9441 | H | -110.3 | -24.1 | 22.67 | 4.67 | -72.1 | -42.1 |
| | V | -107.5 | -23.5 | 22.67 | 4.67 | -71.5 | -41.5 |

Equipment Calibration Information

| Equipment | Serial Number | Cal Date | Cal Due |
|---|---|---|---|
| HP 8563E Spectrum Analyzer | 3221A00149 | 4/15/2010 | 4/15/2012 |
| Agilent E8257D Signal Generator | MY44320507 | 4/20/2010 | 4/20/2012 |
| HP 8901A Modulation Analyzer | 2950A05551 | 4/12/2010 | 4/12/2012 |
| HP 437B Power Meter | 3125U13882 | 4/12/2010 | 4/12/2012 |

Instruments have been calibrated using standards with accuracies traceable to NIST standards.