ENGINEERING STATEMENT IN REGARD TO

MEASUREMENTS OF TRANSMITTER SPURIOUS EMISSION

MAXON AMERICA INC.
FCC ID: F3JSP200U1
MODEL SP200U1

## 1.0 Introduction

Hyak Laboratories, Inc. has been authorized by Maxon America Inc. to perform measurements on the SP200U1 transmitter to determine spurious emissions compliance with FCC Rules, Paragraph 2.993(a)(b,1).

The Maxon Model SP200U1, a hand-held, UHF transceiver, is electrically similar to the Model SP200U2, FCC ID: F3JSP200U2 (March 3, 1999), but covers the 400-430 MHz range.

## 2.0 RF_Power_Output_(Paragraph_2.985)

a) Conducted

RF power output was measured with a Bird Model 4421 RF power meter and a Narda 765-20 50 ohm power attenuator as a dummy load. (The transmitter was tuned by the factory.)

TABLE 1
RF Power Output vs Supply Voltage

| Supply, Volts | Power, Watts | |
|---|---|---|
| | L | H |
| 7.5 | 1.0 | 5.1 |

b) Radiated power (ERP(d) referenced to a dipole.

ERP was measured by substitution as 2.0 watts.

## 3.0 Occupied_Bandwidth_(Paragraphs_2.989(c)_and_90.209(c))

Figures 1a through 1d show plots of the sideband envelope of the transmitter operating at 1.0 or 5.1 watts and 12.5 kHz or 25 kHz channelization respectively taken with a HP 7550 Plotter from the display unit of a Tektronix 494P spectrum analyzer.

## 3.0 Occupied Bandwidth (Paragraphs 2.989(c), 90.209(c)),

and 90.210 (Continued)

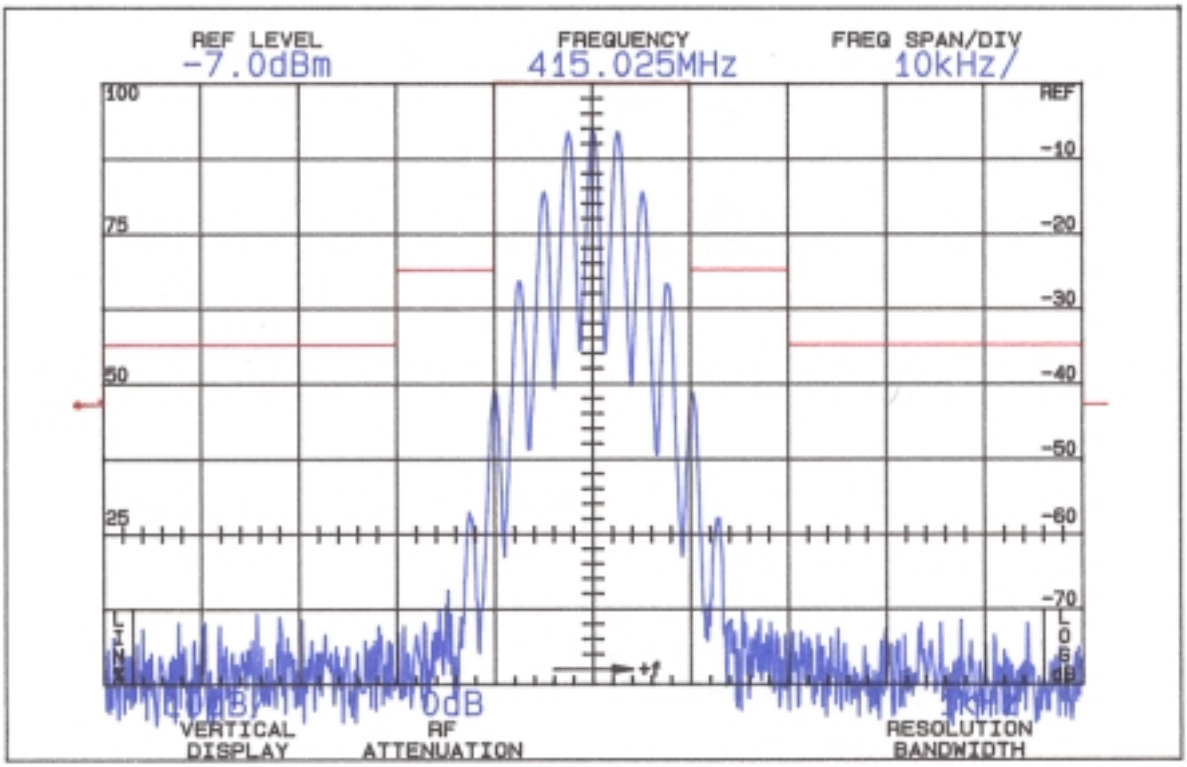
Modulation corresponded to conditions of Paragraph 2.989(c)(1) and consisted of a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50% modulation at 2769 Hz, the frequency of maximum response.

The plots are within the limits imposed by Paragraph 90.209(c) for frequency modulation. The horizontal scale (frequency) is 10 kHz per division and the vertical scale (amplitude) is a logarithmic presentation equal to 10 dB per division.



FIGURE 1a

OCCUPIED BANDWIDTH




REQUIRED ATTENUATION IN dB
BELOW MEAN POWER OUTPUT
Required

| | |
|---|---|
| On any frequency more than 50%, up to and including 100% of the authorized bandwidth, 20 kHz (10 - 20 kHz) | 25 |
| On any frequency more than 100% up to and including 250% of the authorized bandwidth (20 - 50 kHz) | 35 |
| On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth (over 50 kHz) | 43+10 LogP = 43 (P = 1.0W) |

Occupied Bandwidth (1.0W)
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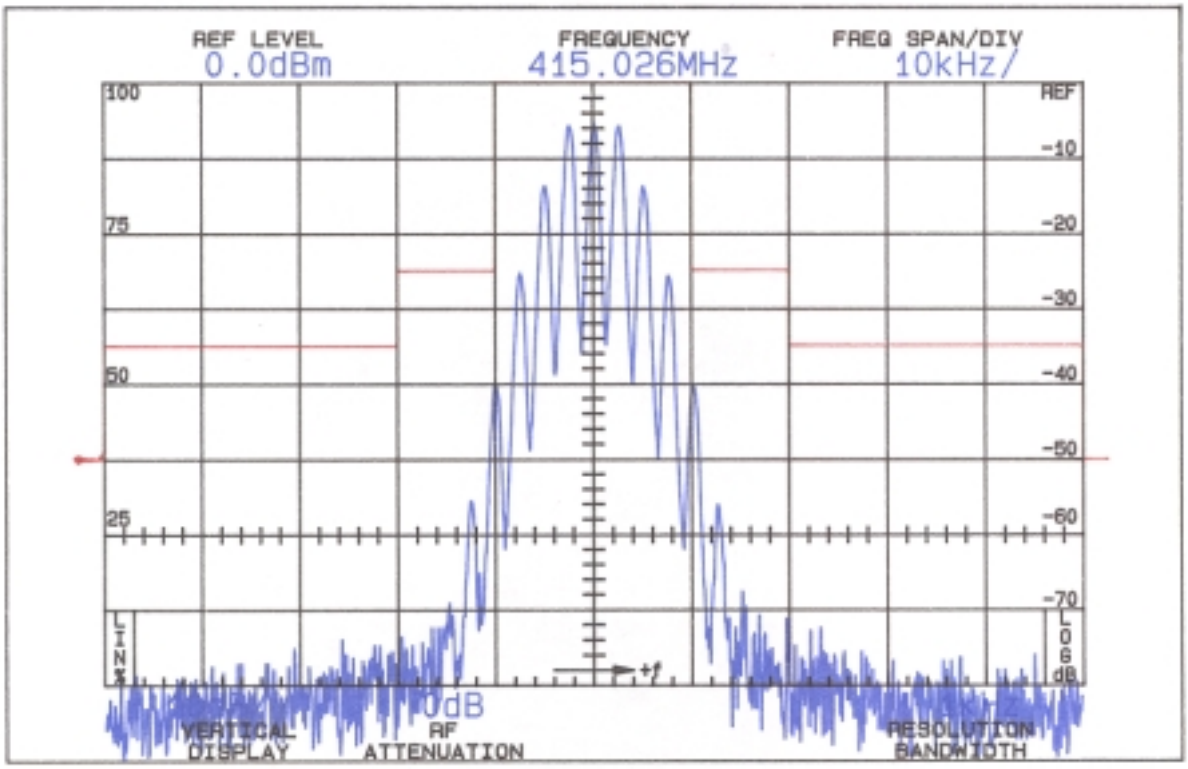
FIGURE 1a (5 kHz)



FIGURE 1b

OCCUPIED BANDWIDTH




REQUIRED ATTENUATION IN dB
BELOW MEAN POWER OUTPUT
Required

| | |
|---|---|
| On any frequency more than 50%, up to and including 100% of the authorized bandwidth, 20 kHz (10 - 20 kHz) | 25 |
| On any frequency more than 100% up to and including 250% of the authorized bandwidth (20 - 50 kHz) | 35 |
| On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth (over 50 kHz) | 43+10 LogP = 50 (P = 5.1W) |

Occupied Bandwidth (5.1W)
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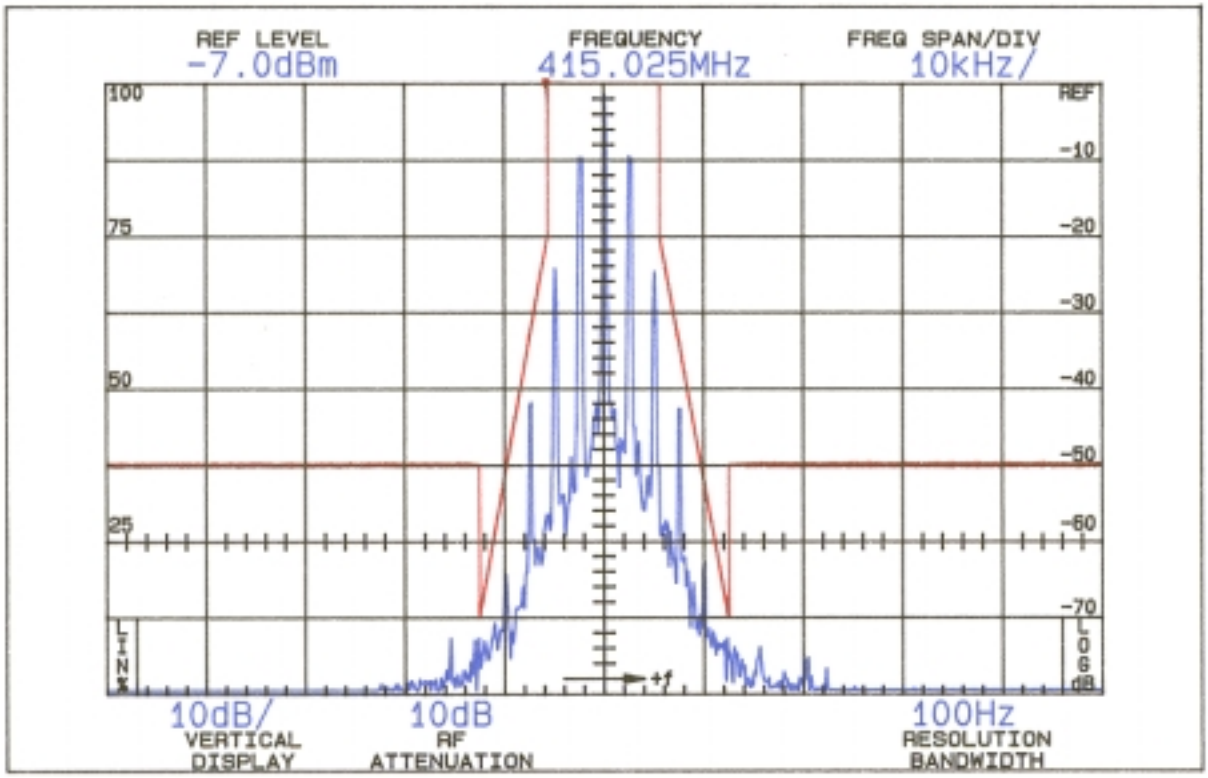
FIGURE 1b (5 kHz)



FIGURE 1c

OCCUPIED BANDWIDTH




| | ATTENUATION IN dB BELOW MEAN OUTPUT POWER Required |
|---|---|
| On any frequency from the center of the authorized bandwidth $f_o$ to 5.625 kHz removed from $f_o$. | 0 (>5.625 kHz) |
| On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_d$ in kHz) of more than 5.625 kHz but no more than 12.5 kHz: at least 7.27 ($f_d$ - 2.88 kHz) dB. | 70 (@ 12.5 kHz) |
| On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_d$ in kHz) of more than 12.5 kHz. | 50+10LogP = 51 (>12.5 kHz) (P = 1.0W) |

OCCUPIED BANDWIDTH (F3E 1.0W)
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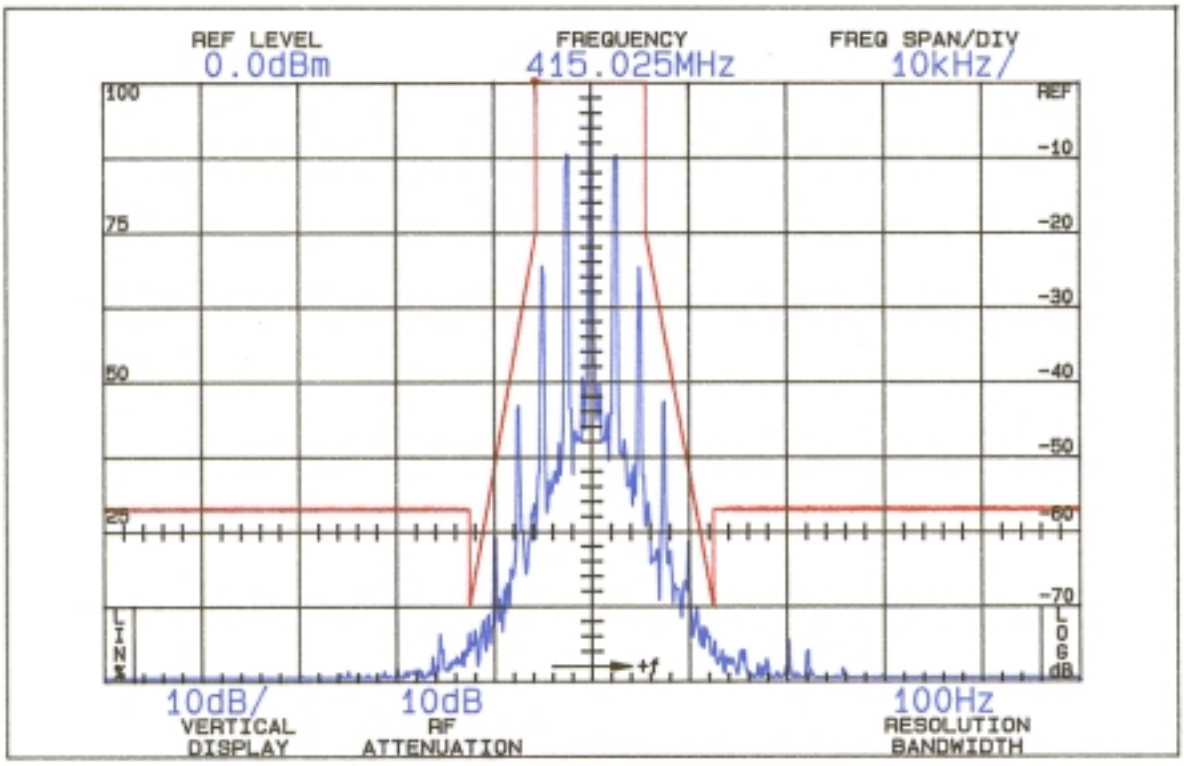
FIGURE 1c (2.5 kHz)



FIGURE 1d

OCCUPIED BANDWIDTH




| | ATTENUATION IN dB BELOW MEAN OUTPUT POWER Required |
|---|---|
| On any frequency from the center of the authorized bandwidth $f_o$ to 5.625 kHz removed from $f_o$. | 0 (>5.625 kHz) |
| On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_d$ in kHz) of more than 5.625 kHz but no more than 12.5 kHz: at least 7.27 ($f_d$ - 2.88 kHz) dB. | 70 (@ 12.5 kHz) |
| On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_d$ in kHz) of more than 12.5 kHz. | 50+10LogP = 57 (>12.5 kHz) (P = 5.1W) |

OCCUPIED BANDWIDTH (F3E 5.1W)
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FIGURE 1d (2.5 kHz)



4.0 Spurious_Emissions_at_the_Antenna_Terminals

Paragraph 2.991 of the Rules)

The SP200U1 transmitter was tested for spurious emissions at the antenna terminals while the equipment was modulated with a 2500 Hz signal, 16 dB above minimum input signal for 50% (2.5 kHz deviation) modulation at 2769 Hz, the frequency of highest sensitivity.

Measurements were made with a Tektronix 494P spectrum analyzer coupled to the transmitter output terminal through a Narda 765-20 50 ohm power attenuator.

During the tests, the transmitter was terminated in the Narda attenuator; carrier was notched. Power was monitored on a Bird 4421 RF power meter; dc supply was 7.5 throughout the tests.

Spurious emissions were measured throughout the RF spectrum from 6 (Lowest frequency generated in the transmitter is 12.8 MHz) to 4.2 GHz. Any emissions that were between the required attenuation and the noise floor of the spectrum analyzer were recorded. Data are shown in Table 2, following.

TABLE 2

TRANSMITTER CONDUCTED SPURIOUS
415.025 MHz, 7.5 Vdc

| Frequency, MHz | dB Below Carrier_Reference | |
|---|---|---|
| | L 1.0W | H 5.1W |
| 830.051 | 85 | 90 |
| 1245.078 | 92 | 92 |
| 1660.102 | 98 | 94 |
| 2075.123 | >100 | >100 |
| 2490.147 | 99 | >100 |
| 2905.172 | 100 | >100 |
| 3320.196 | >100 | >100 |
| 3735.221 | >100 | >100 |
| 4150.245 | >100 | >100 |
| Required: 43+10 Log(P) | 47 (54) | 50 (57) |

All other spurious were 20 dB or more below FCC limit from 12.8 MHz to the 10th harmonic.

Carrier attenuated with notch filter.



5.0 Description_of_Measurement_Facilities

A description of the Hyak Laboratories' radiation test facility is a matter of record with the FCC. The facility is currently listed as an acceptable site.

## 6.0 Field_Strength_Measurements_of_Spurious_Radiation (Paragraph 2.993(a)(b,2) of the Rules)

Field intensity measurements of radiated spurious emissions from the Maxon SP200U1 were made with a Tektronix 494P spectrum analyzer using Singer DM-105A calibrated test antennae for the measurements to l GHz, Polarad CA-L horn from 1 to 2.4 GHz, and CA-S Horn from 2.4 to 4.2 GHz. The transmitter and dummy load were located in an open field 3 meters from the test antenna. Supply voltage was a power supply with a terminal voltage under load of 7.5 Vdc. Conducted output power was 5.1 watts at the 415.025 MHz operating frequency. The transmitter and test antennae were arranged to maximize pickup. Both vertical and horizontal test antenna polarization were employed.

Reference level for the spurious radiations was taken as an ideal dipole excited by 2.0 watts, based on antenna substitution. Emissions less than 20 dB below the 2.0 watts reference were determined by substituting signal source antenna.

The measurement system was capable of detecting signals 100 dB or more below the reference level. Measurements were made from the lowest frequency generated within the unit, 12.8 MHz, to 10 times operating frequency, 4.2 GHz. Data are shown in Table 3.

TABLE 3

TRANSMITTER CABINET RADIATED SPURIOUS
415.025 MHz, 7.5 Vdc, 2.0 watts ERP(d)

| Frequency MHz | dB Below Carrier Reference[1] |
|---|---|
| 836.051 | 68V |
| Required: 50+10 Log(2.0) | 53 |

All other spurious from 12.8 MHz to the tenth harmonic were 20 dB or more below FCC limit.

[1]Worst-case polarization, H-Horizontal, V-Vertical



## 7.0 Statement

Technical test data herein are from tests performed by me or under my supervision. My qualifications are a matter of record with the Federal Communications Commission. I personally attest to the accuracy of the test data submitted as a part of this engineering statement.

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Rowland S. Johnson

Dated: November 30, 2000