MICROWAVE RADIO COMMUNICATIONS

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ENGINEERING CERTIFICATION

It is here by stated that as an ISO-2000 certified company the Certification tests on the Microwave Radio Communications STRATA High Power (5Watt) (STAHPU2D) where made under factory test conditions. All test equipment calibration certification is on file here at the Microwave Radio Communications Inc. facility. All of the submitted data in the attached report is true and correct to the best of my knowledge and belief.

Report No 00121703

Manufacturer	Microwave Radio Communications Inc.
Model	STAHPU2D
FCC ID	**FC3**
Equipment Type	TNB
Results	As detailed within this report

Prepared by

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Authorized By

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Introduction:

The STAHPU2D is a general mobile Amplifier designed for use in the **1999 Mhz. to 2700 Mhz.** band.

Emissions: 17M0D9W, 17MOW7d, 16MOW7D (Digital Modulation)

Operation under FCC rule parts **74, 90**

Application:

For transmission at higher RF output levels utilizing the STRATA Transmitter (STATXU2D) operating in the same frequency bands with factory loaded pre – assigned channel plans. The amplifier is designed to boost the available out put of the transmitter to as high a 5W or within specified limitations for output power or stated limits for EIRP with in the user specified band. Specifically for the transmission of video, audio, data, and related Television Broadcast program material from events occurring at points removed from the TV Broadcast station or other users.

A compact, portable weatherproof, modular Amplifier. Designed to be adaptable over a wide range of outdoor field applications. Tha Amplifier accepts a wide range of modulation architectures that are governing the final output power of the device with maximum output levels at QPSK modulation of 5Watts. The intended transmitter associated with the application has the means to drive the input to this device in accordance with its ability to meet specified MER and continuously meet the FCC requirement for emissions and spectral efficiency.

A front panel LED displays the unit in transmit or standby mode. The associated transmitter is designed to deliver reduced RF to the device in digital applications to maintain linear operation.

The STRATA Amplifier can be deployed with the STRATA transmitter controlling its operation as a dual box design. RF interconnection is via 50 ohm type “N” (F) connection. The Amplifier has been designed and intended to operate as an alternative solution to provide the user with the output required to elevate the functionality of the STRATA transmitter where it is restricted in output power capability due to its compact design.

It is intended but not limited to providing an enhanced COFDM capability utilizing QPSK modulation for the outside broadcast industry. It harbors no intelligence but requires supervision which is provided through front panel or pre – assigned control via software configurable parameters of the STRATA transmitter.

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TECHNICAL DESCRIPTION

A technical description is contained within the manual

MEASUREMENT DATA

In Order to demonstrate compliance to the FCC Rules and Regulations as set forth in CFR 47 (as revised October 1, 2002), measurement data per paragraphs2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 where performed at Microwave Radio Communications facilities. The results of these measurements show that the STAHPU2D transmitter meets or exceeds all requirements for parts 74, 78, 90 and 101.

SPURIOS EMISSIONS AT ANTENNA TERMINAL (CONDUCTED SPURIOUS)

The Antenna conducted spurious emissions test set up is shown in Figure 1. The analyzer was first tuned for a reference carrier level at the fundamental operating frequency. The output spectrum was then slowly scanned from 50MHz to 26 GHz. Special attention was given to those frequencies that correspond to the possible harmonic and sub – harmonics.
2050.5 MHZ nothing found.
4100 MHZ nothing found.
6151.5 MHZ nothing found.
82002MHZ nothing found.
10252.5 MHZ nothing found.
12303 MHZ nothing found.
14353.5 MHZ nothing found.
16404 MHZ nothing found.
18454.5 MHZ nothing found.
20505 MHZ nothing found.
22555.5 MHZ nothing found.

The FCC limit for antenna conducted spurious emissions is 43+10LOG P below the main carrier. For the STATXU2D with P=5 W this corresponds to 49.99db below the main carrier (+37dbm) , or a level of –12.99dBm.

No spurious signals were noted within the FCC limit. Therefore, the STAHPU2D meets the requirements set forth in paragraphs , 74.637, 78.103, 90.209, and 101.111.

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FIELD STRENGTH OF SPURIOUS RADIATION

Case radiated spurious emission test set up is shown in figure 2. Observations where made at one meter from the transmitter in all planes of polarization. The output spectrum as received at one meter was slowly scanned upwards from 50MHz to 26GHz. Spacial attention was given to those frequencies which correspond to possible harmonics and sub harmonics.
A radiated reference level can be calculated using the formula:

$$E = \sqrt{\frac{30xGxP}{R}}$$

Where: G = Power Gain of Antenna
P = Transmitter Power Output in Watts
R = Distance from Radiator at which field intensity is measured.

In this case: G = 1.64 (gain of dipole over isotropic)
P = 5
R = One Meter

Therefore:

$$E = \sqrt{\frac{30x1.64x5}{1}} = 15.684V/meter = 143.909dBuV/M$$

Tests where performed in accordance with TIA 603 – B and special attention was paid to possible emissions of harmonic s 1 through 10 as noted in the previous tests of conducted spurious emissions
It is clearly understood that in accordance with TIA-603-B sec 2.2.12 that measurable unwanted radiated spurious emissions if noted by testing to the method of measurement in para. 2.2.12.1 would require further investigation to qualify and quantify the absolute level of an identified spurious emission by further testing as per the RF signal substitution method as stated in para. f. to the end of para. n. In the case of this amplifier, no spurious emissions where noted to the dynamic noise threshold of the analyzer used to perform this test (ref. Test equipment document). It is thusly understood that no further testing beyond this level is required.

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The FCC requires case radiated signals to be attenuated by a factor of 43+10LOG P or 43+10LOG 5.0 = 49.99dB. Thus 143.909dBuV/M reduced by 49.99dB = 93.919dBuV/M. No case radiated signals were detected within the FCC specification as set forth in CFR 47 for parts 74 and 90.

NECESSARY BANDWIDTH

The OFDM pedestal operating at 1705 OFDM carriers with the spectral density of each carrier at 4.464KHz.

Therefore: 1705 X 4.464KHz = 7.6111200 MHz

OCCUPIED BANDWIDTH

To measure the occupied bandwidth, the equipment was set up as shown in figure 1, and the transmitter was modulated with a digital COFDM pedestal of 7.61MHz (8MHz). The output of the transmitter was viewed on a spectrum analyzer. The current COFDM standard adopted by Microwave Radio Communications is the ETSI EN 300 744 V1.2.1 (2001-01) for framing structure, channel coding and modulation. Since the spectrum is digitally modulated, at the center frequency, calculations where performed by establishing a reference at Fo (2050.5MHz) and the amplitude readings where calculated from a CW signal input to the amplifier. Amplitude readings where then recorded as specified in part 101.111 for emission limitations.

Method of Measuring and Calculating Occupied Spectrum Requirements (Digital Mode)

Steps:

1. Determine 3 dB down points on SIN(X)/X center frequency spectrum energy plot.
2. Use the following formula to calculate the total power signal level versus the spectral energy plot:

   10log (3dB bandwidth) / (Resolution Bandwidth filter used)

   3dB bandwidth = **7.61 MHz** (4.4 KHz w/1705 COFDM carriers)
   Resolution Bandwidth used = **100 KHz**

   for Strata TX system: 10log 7.61E6/1E5 = **18.8 dB**

3. Adjust for FCC requirement to calculate using **1 MHz** resolution bandwidth (per FCC ruling 02-098, November 2001). Adjust RBW: 10log 1E6/1E5 = 10 dB

TOTAL POWER ADJUSTMENT FACTOR = **8.8 dB** above highest spectral energy point.

RF POWER OUTPUT

The RF output power test set up is shown in figure 2.

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POWER OUTPUT AND FREQUENCY STABILITY

PARAGRAPHS 2.1046 AND 2.1055

Measurements where made to determine the amplifier stability and power output over the temperature range 25 degrees C to –35 degrees C. The equipment was connected as shown in figure 3 and the temperature was cycled automatically as recorded in table 1. The transmitter was allowed to stabilize a minimum of 30 minutes before measurement. Power and frequency measurements where performed simultaneously

Measurements where also made to determine amplifier frequency stability versus primary supply variation of the DC input voltage range of 12V to 48V. The equipment was connected as shown in figure 3. The test data is listed in Table 1 which shows no frequency change.

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