FCC PART 74 TEST REPORT

Applicant:	Zaxcom Inc.
Address:	230 West Parkway Unit 9
	Pompton Plains, NJ 07444
Contact:	Glenn Sanders
Title:	President
FCC ID:	PR6TRX
Model:	TRX900, TRX900AA
Trade Name:	N/A
Product Description:	Wireless Microphone
Frequency:	662 – 686 MHz
Test Date:	May 10, 2006
Report Date:	May 18, 2006
Approved By:	Glenn Sanders

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EXECUTIVE SUMMARY

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In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 1999, Part 2 Subpart J, Paragraphs 2.907, 2.911 to 2.913, 2.925, 2.926, 2.1031 through 2.1057 and; Part 74 Subpart H; Paragraphs 74.801 through 74.861 the following is submitted:

2.1033 Application for certification:

According to section 2.1033 the following exhibits are required:

(1) Name and Address: Zaxcom Inc.
140 Greenwood Ave, BLDG. #2
Midland Park, NJ 07432

(2) FCC Identifier: PR6TRX

(3) Manual/instructions: See the Operating manual in a separate exhibit.

(4) Type of Emissions: 180K D2E

(5) Frequency range: 662 MHz to 686 MHz with lockout provisions on restricted frequency bands

(6) Range of operating power values or specific operating power levels and description of any means provided for varying the output power: The output power is fixed at 34 mW nominal. The transmitter has no provision for operator variation of the output power.

(7) The maximum power rating as defined in the applicable part(s) of the rules. As stated in CRF 47, 74.861 (e) (ii), the maximum permissible output power is 250 mW

(8) The DC voltages applied to and DC currents into the several elements of the final radio frequency amplifying device for normal operation over the power range. The final amplification stage operates at 3.8 Volts and draws 100 mA for a power requirement of 380mW.

(9) Tune-up procedure over the power range, or at specific operating power levels. See tune-up procedure in the Appendix of this document.

(10) A schematic diagram and a description of all circuitry and devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation, and for limiting power. See schematics supplied with in a separate exhibit.

(11) A photograph or drawing of the equipment identification plate or label showing the information to be placed thereon. See FCC ID label supplied in the photo exhibit supplied with this application.

(12) Photographs (8"x10") of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, if any, and labels for controls and meters and sufficient views of the internal construction to define component placement and chassis assembly. Insofar as these requirements are met by photographs or drawings contained in instruction manuals supplied with the certification request, additional photographs are necessary only to complete the required showing. See the photo section in photo exhibit supplied with this application.

(13) For equipment employing digital modulation techniques, a detailed description of the modulation system to be used, including the response characteristics (frequency, phase and amplitude) of any filters provided, and a description of the modulating wave train, shall be submitted for the maximum rated conditions under which the equipment will be operated.
See the appendix at the end of this document for details.

(14) The data required by § 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in § 2.1041.

LIST OF TEST INSTRUMENTATION

The following instrumentation is used in the measurement of emissions. All test equipment calibration is N.I.S.T. traceable.

Manufacturer	Description	Model	Serial Number
ADVANTEST	Spectrum Analyzer	R3361A	91730394
AILTECH	Log Periodic Antenna	90005	3146 1095
EMCO	Horn Antenna	3115	2498
FLUKE	Digital Multimeter	76	6540398
GLOBAL Laboratories	3, 10 & 30 meter O.A.T.S.	N/A	N/A
RAYPROOF	Shielded Room		4536
Rohde & Schwarz FSEA 3.5 GHz	spectrum analyzer	FSEA 3	843263/003
SCHWARZBECK	Biconical Antenna	VHA-9103	"A"
SCHWARZBECK	RF Receiver 30 to 1000 MHz	VUME 1520	1520427
Hewlett Packard	Spectrum Analyzer	8569B	37974

2.1046 RF POWER OUTPUT

Measurements Required

Measurements shall be made to establish the radio frequency power delivered by the transmitter into the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun except as noted below: If the power output is adjustable measurements shall be made for the highest and lowest power levels.

Test Arrangement

Transmitter -- --> Spectrum Analyzer

The RF output power of the transmitter was measured at the antenna output directly with a Rohde & Schwarz FSEA 3.5 GHz spectrum analyzer. The input to the spectrum analyzer had an impedance of 50 ohms, which matched the transmitter's antenna terminal. The power data was read in dBm and converted to watts as shown below. See Table 1 and Figure 1, which show the output power measurements. Data was accumulated as per 2.1046(a) and applicable paragraphs of Part 74.

P dBm = Power in dBm = Power in dB above 1 milliwatt

milliwatts = 10 ^ (PdBm/10)

dBm = 10 (/10) = mW

mW * (1 Watt / 1000mW)

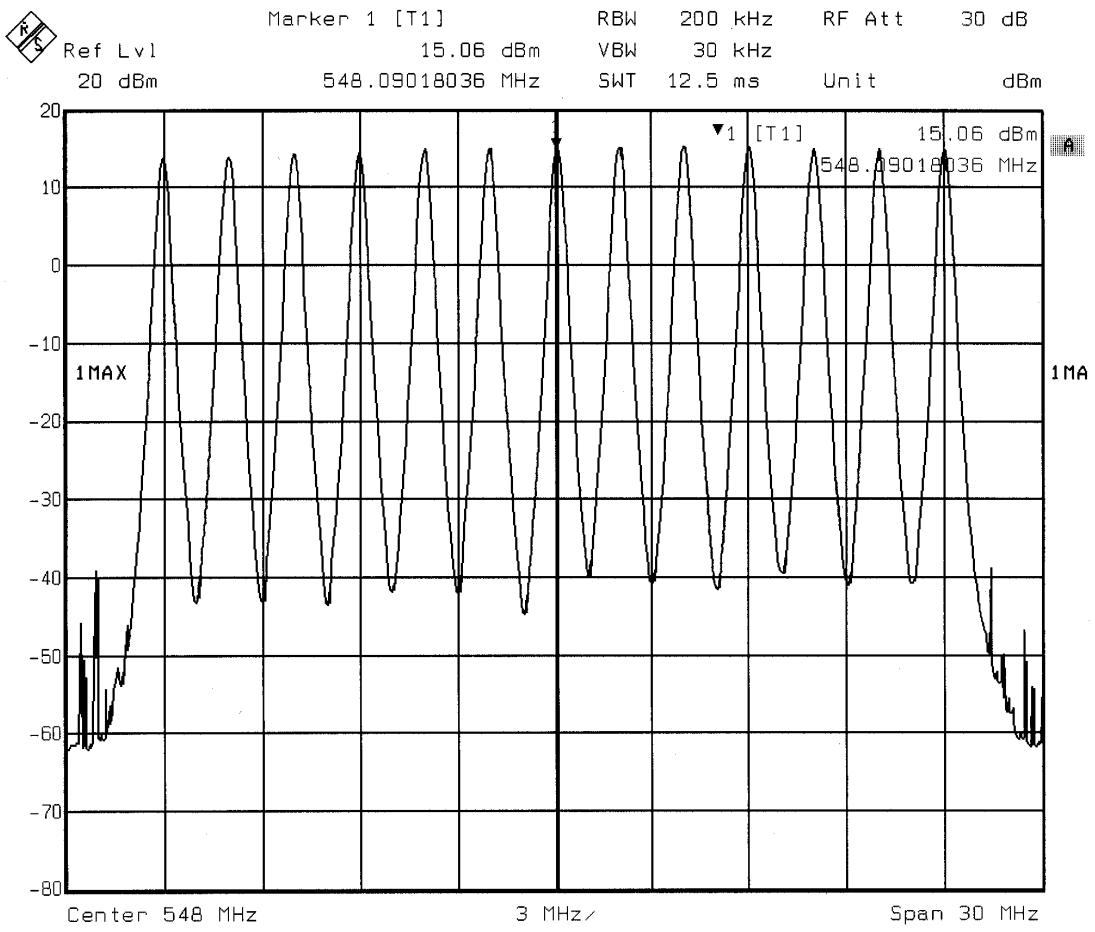
= Watts

Measurement Results

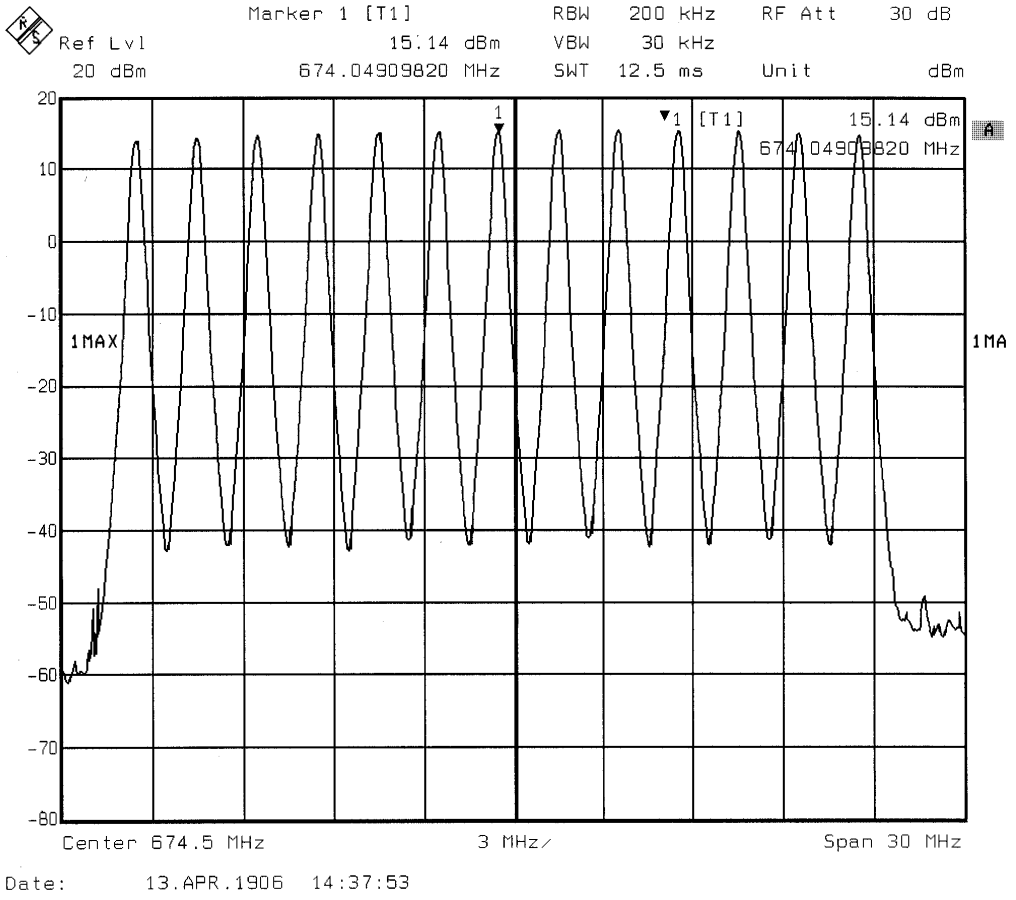
Frequency (MHz)	Power (dBm)
536	13.56
538	13.95
540	14.19
542	14.30
544	14.76
546	14.90
548	15.06
550	15.09
552	15.12
554	15.07
556	14.92
558	14.85
560	14.61

Frequency (MHz)	Power (dBm)
662	13.97
664	14.20
666	14.55
668	14.72
670	14.88
672	15.11
674	15.14
676	15.27
678	15.37
680	15.19
682	15.06
684	14.86
686	14.66

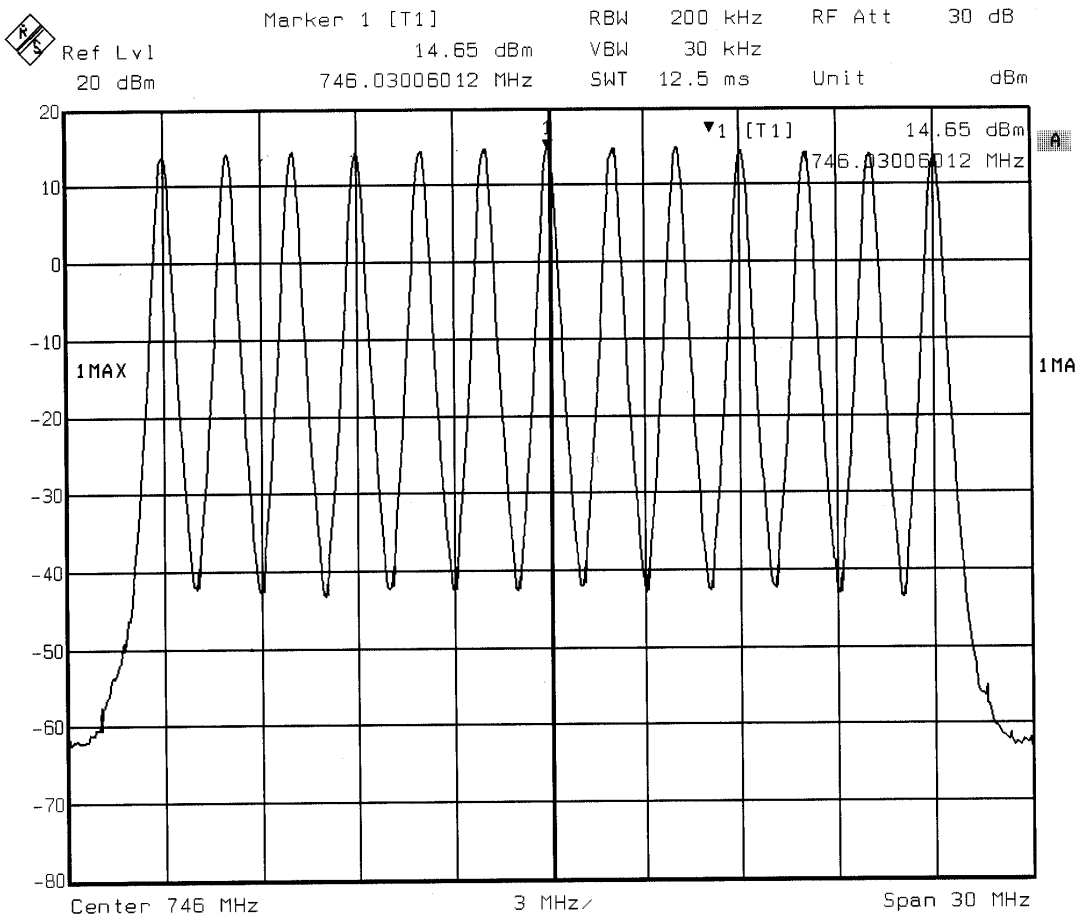
Frequency (MHz)	Power (dBm)
734	13.92
736	14.10
738	14.38
740	14.40
742	14.44
744	14.61
746	14.65
748	14.70
750	14.56
752	14.42
754	14.120
756	13.93
758	13.75



13.56 dBm 536 MHz
13.95 538
14.19 540
14.30 542
14.76 544
14.90 546
15.06 548
15.09 550
15.12 552
15.07 554
14.92 556
14.85 558
14.61 560



13.97dBm 662 MHz
14.20 664
14.55 666
14.72 668
14.88 670
15.11 672
15.14 674
15.27 676
15.37 678
15.19 680
15.06 682
14.86 684
14.66 686



13.92 dBm	734MHz	14.10	754
14.10	736	13.93	756
14.38	738	13.75	758
14.40	740		
14.44	742		
14.61	744		
14.65	746		
14.70	748		
14.56	750		
14.42	752		

2.1047 MODULATION CHARACTERISTICS

Measurements Required

A curve or equivalent data, which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

Test Arrangement

Audio Waveform Generator -- --> Transmitter -- --> Spectrum Analyzer

The RF output of the transmitter was coupled to a Rohde & Schwarz FSEA 3.5 GHz spectrum analyzer. The spectrum analyzer was used to measure the transmitter's RF spectrum characteristics under various conditions.

The transmitter converts the audio microphone input from an analog to a digital data stream using an Analog to Digital Converter. The data is randomized and formatted into a serial bit stream at a rate of 640,000 bits per second. The bit stream is grouped into symbol clusters of 4 bits each. These 4 bit symbols, operating at a rate of 160,000 symbols per second, are mapped into a 16-QAM signal constellation. The I and Q samples are sent to a high speed Digital to Analog converter which converts the waveform into an analog I and Q waveform. The analog waveform is filtered by two RC filters and a PI filter with a combined 3 dB cut-off frequency of 90 kHz to remove images produced by the IQ DAC.

The filtered IQ analog waveform is applied to a quadrature modulator for direct conversion to the final RF carrier frequency before being amplified by the final linear power amplifier.

The nature of the digital encoding process produces a constant symbol rate of 160,000 symbols per second regardless of the nature or amplitude of the microphone audio signal. Thus the RF spectrum does not change its appearance or occupied bandwidth based on the audio data being transmitted.

Test Results

The output RF spectrum was observed while applying a 20 Hz to 20,000 Hz sine wave to the audio input. There was no apparent change in the shape of the spectrum while varying the frequency and amplitude of the audio input. In addition to the audio sweep, worst-case constellation sub-patterns including maximum and minimum amplitude constellation sub-sets were forced and observed to

ensure that no spreading of the RF spectrum occurred. Since the modulation is digital, there was no audio frequency response characterization made of the device.

2.1049 OCCUPIED BANDWIDTH

Measurements Required

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

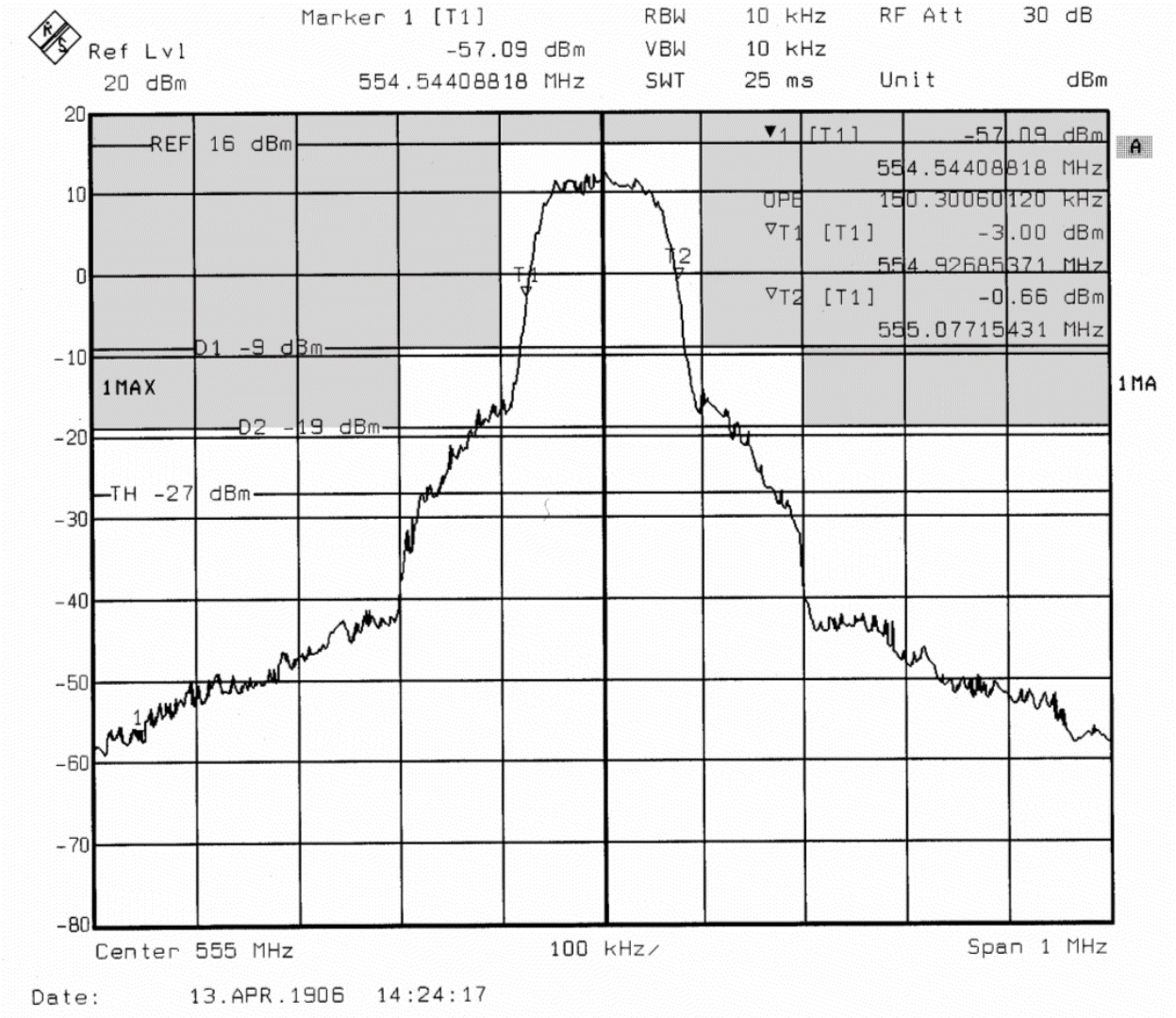
Test Arrangement

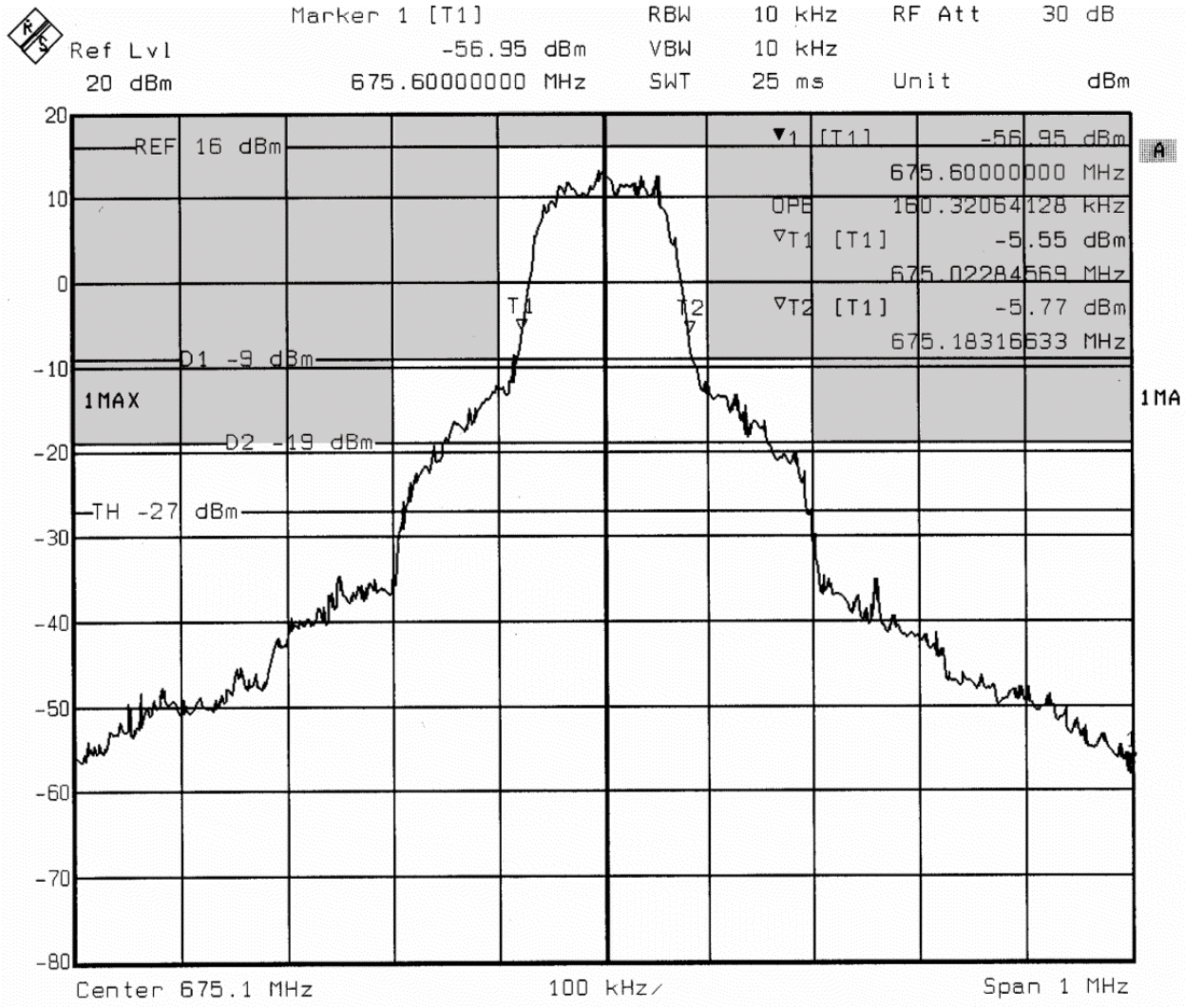
Transmitter ----> Spectrum analyzer

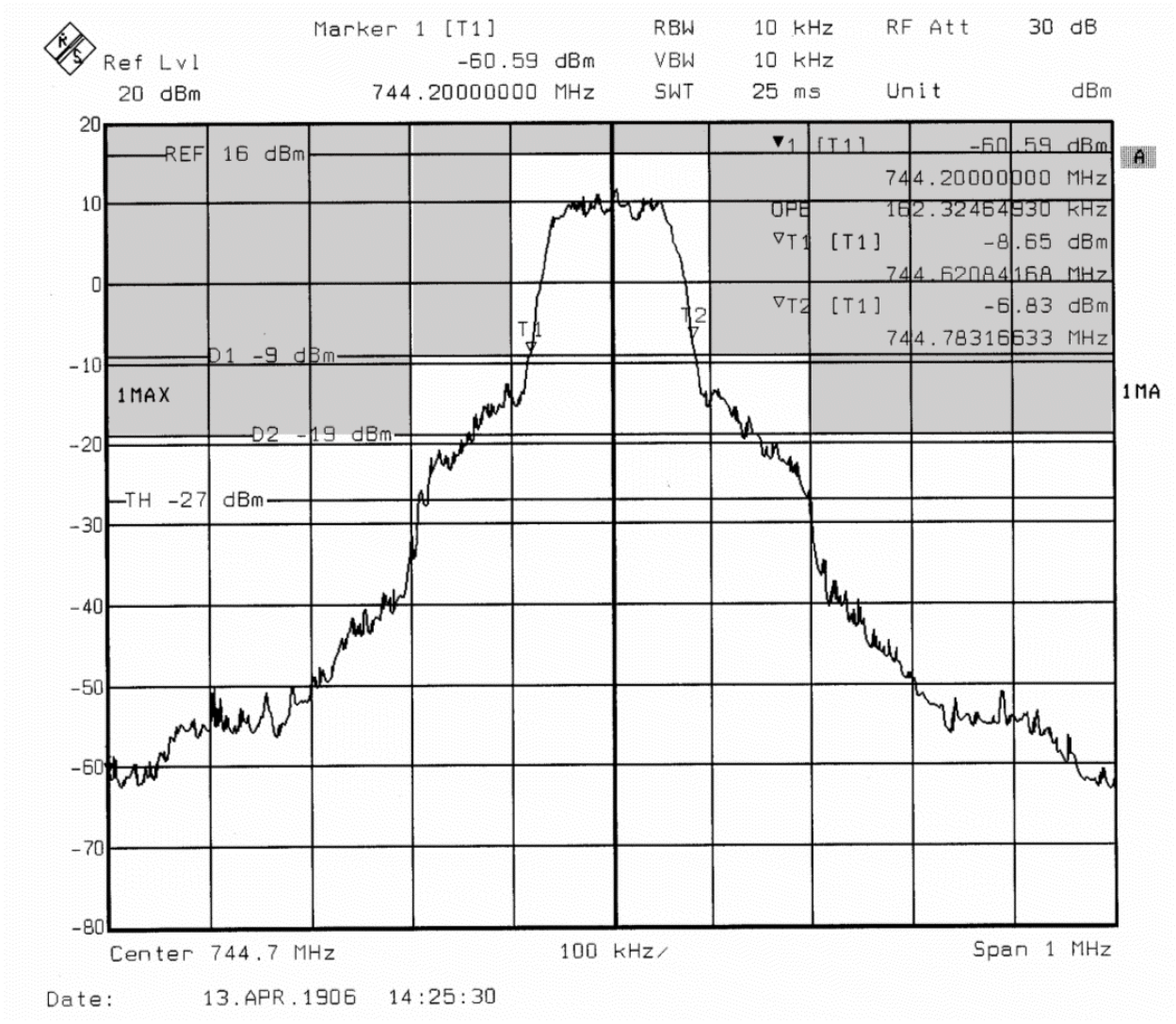
A spectrum analyzer was used to measure the RF spectrum of the transmitter while modulated by a frequency of 2,500 Hz and again at 15,000 Hz. The power ratio representing 99.5% of the total mean power was measured by the spectrum analyzer. Figure 2 indicates the results of the occupied bandwidth and spectral mask measurements.

Test Results

Center Frequency (MHz)	Occupied Bandwidth (kHz)
744.20	162.32


Marker 1 [T1]
RBW 10 kHz
RF Att 30 dB
Ref Lvl
-57.09 dBm
VBW 10 kHz
20 dBm
554.54408818 MHz
SWT 25 ms
Unit dBm
REF 16 dBm
▼1 [T1] -57.09 dBm
554.54408818 MHz
OPB 150.30060120 kHz
▽T1 [T1] -3.00 dBm
554.92685371 MHz
▽T2 [T1] -0.66 dBm
555.07715431 MHz
D1 -9 dBm
1MAX
D2 -19 dBm
TH -27 dBm
T1
T2
1
A
1MA
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 555 MHz
100 kHz/
Span 1 MHz
Date: 13.APR.1906 14:24:17


Marker 1 [T1]
RBW 10 kHz
RF Att 30 dB
Ref Lvl
-56.95 dBm
VBW 10 kHz
20 dBm
675.60000000 MHz
SWT 25 ms
Unit dBm
REF 16 dBm
▼1 [T1] -56.95 dBm
675.60000000 MHz
OPB 180.32064128 kHz
▽T1 [T1] -5.55 dBm
675.02284569 MHz
▽T2 [T1] -5.77 dBm
675.18316633 MHz
D1 -9 dBm
1MAX
D2 -19 dBm
TH -27 dBm
T1
T2
A
1MA
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 675.1 MHz
100 kHz/
Span 1 MHz


Marker 1 [T1]
RBW 10 kHz
RF Att 30 dB
Ref Lvl
-60.59 dBm
VBW 10 kHz
20 dBm
744.20000000 MHz
SWT 25 ms
Unit dBm
REF 16 dBm
D1 -9 dBm
1MAX
D2 -19 dBm
TH -27 dBm
T1
T2
1MA
Center 744.7 MHz
100 kHz/
Span 1 MHz
Date: 13.APR.1906 14:25:30

2.1051 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Measurements required

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna.

Test Arrangement

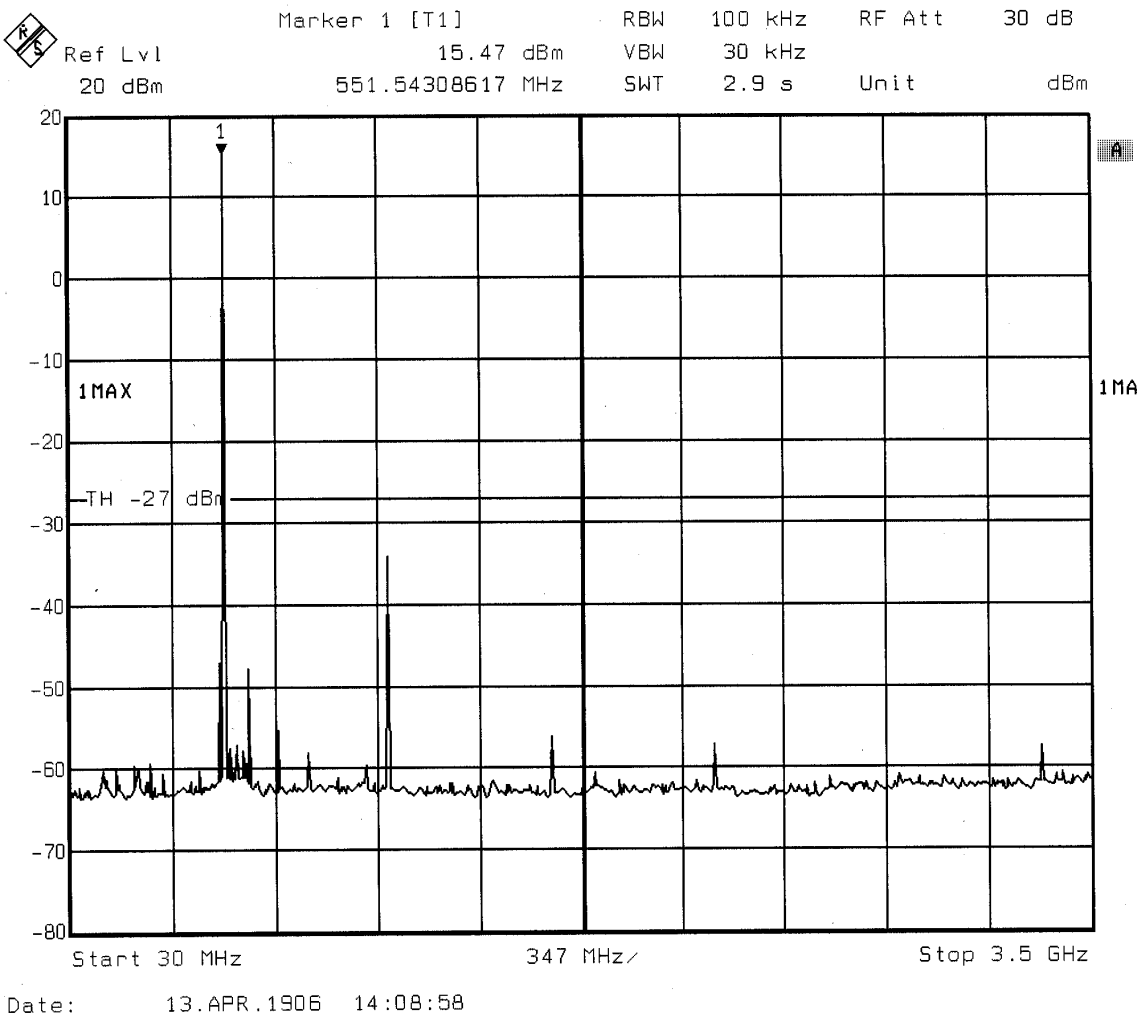
Transmitter -- --> Spectrum Analyzer

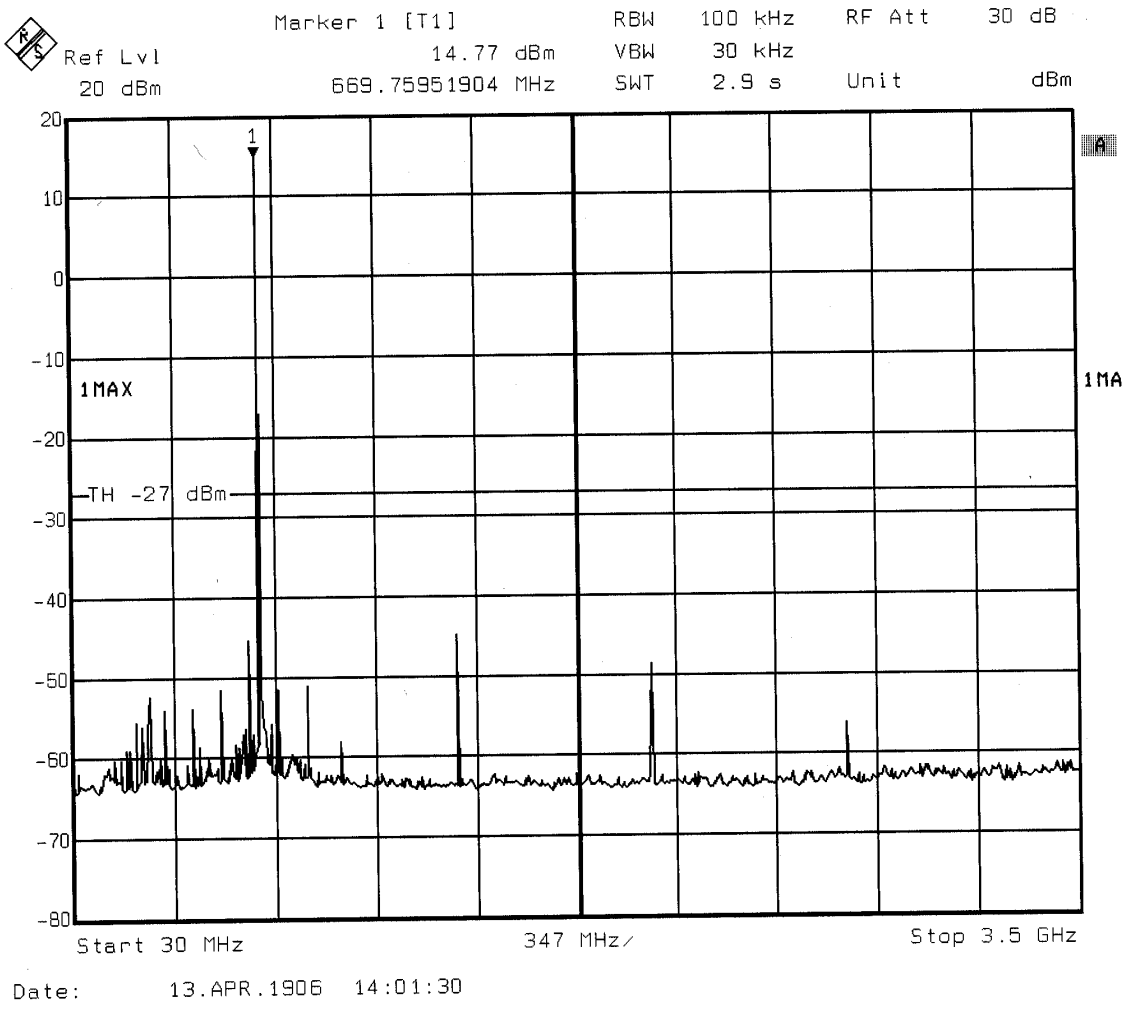
The RF output of the transmitter was coupled to a Rohde & Schwarz FSEA 3.5 GHz spectrum analyzer. The spectrum analyzer was used to measure the spurious emissions of the transmitter while operating in normal mode. The RF frequency spectrum from 30 MHz to 10.0 GHz was observed. Figure 3 shows the results of these measurements. The data was taken as per 2.1057, and the applicable paragraphs of Part 74.

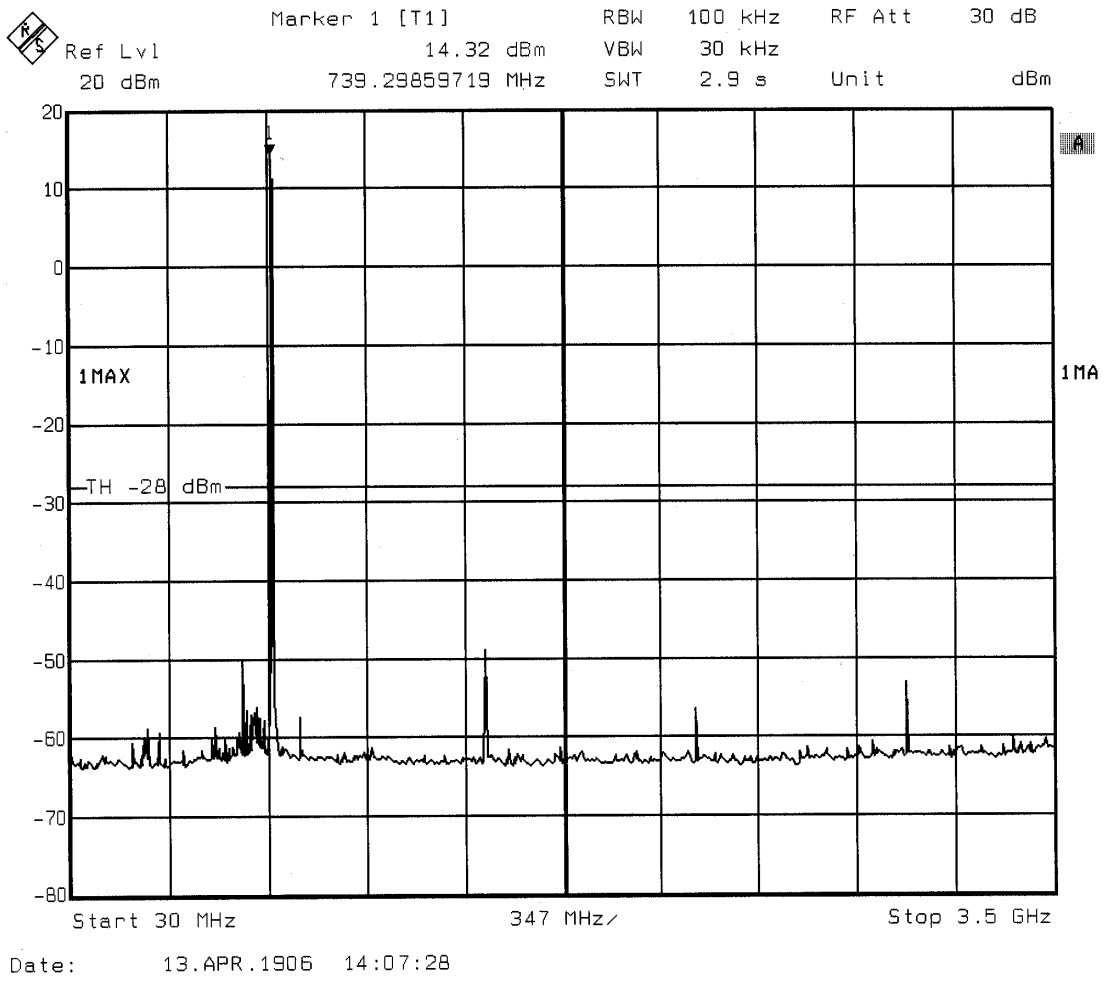
Test Results

The RF output of the transmitter was coupled to a Rohde & Schwarz FSEA 3.5 GHz spectrum analyzer and the RF emissions were measured. The data was taken as per 2.1057, and the applicable paragraphs of Part 74. The specifications of Paragraphs 2.1051,2.1057 and the applicable paragraphs of Part 74 are met. There are no deviations to the specifications.

The spurious emissions must be attenuated at least 43+10log(Po) be low the level of the carrier frequency. All Spurious emissions above 3.5 GHz measure less than –80 dB below the main carrier level.


Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
15.47 dBm
VBW 30 kHz
20 dBm
551.54308617 MHz
SWT 2.9 s
Unit dBm
1MAX
TH -27 dBm
1MA
Start 30 MHz
347 MHz/
Stop 3.5 GHz
Date: 13.APR.1906 14:08:58


Marker 1 [T1]
14.77 dBm
669.75951904 MHz
RBW 100 kHz
VBW 30 kHz
SWT 2.9 s
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1MAX
TH -27 dBm
1MA
Start 30 MHz
347 MHz/
Stop 3.5 GHz
Date: 13.APR.1906 14:01:30


Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
14.32 dBm
VBW 30 kHz
20 dBm
739.29859719 MHz
SWT 2.9 s
Unit dBm
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1MAX
TH -28 dBm
1MA
Start 30 MHz
347 MHz/
Stop 3.5 GHz
Date: 13.APR.1906 14:07:28

2.1053 FIELD STRENGTH OF SPURIOUS RADIATION

Please refer to Timco Engineering report

2.1055 FREQUENCY STABILITY

Measurements required

The frequency stability shall be measured with variations of ambient temperature from -30° to +50° centigrade.

Measurements shall be made at the extremes of the temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. In addition to temperature stability the frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
(2) For hand carried, batteries powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

Specific Measurement Procedure

For this test, the battery was replaced with a variable voltage power supply. The voltage was stepped by 0.1 voltage steps. After the near instant frequency stabilization, the transmitter frequency was measured by the frequency counter function of the spectrum analyzer.
The Advantest R3361A spectrum analyzer was set to the following settings:
ATT = 50dB, REF = 20 dBm, RBW = 100 kHz, VBW = 100 kHz, Span = 10MHz,
SWP = 50ms, 10dB/ for the battery voltage variation tests. As with the temperature tests, an adapter cable supported the transmitter and connected it to the spectrum analyzer.
The analyzer was operating in the frequency counter mode.
Section 74.861(4) requires the frequency stability to be within 0.005% from nominal for battery voltage variations.

Test Arrangement for Power Voltage Stability

Variable Power supply ---> Transmitter ---> Frequency Counter

Measurement Results

662 MHz

Battery Voltage	Frequency MHz	Deviation From Nominal	Percentage %
3.6	662.319845	.010034	0.00015150
3.7	662.319878	.010001	0.00015100
3.8	662.329879	0	0.00000000
3.9	662.330000	.000121	0.00018269
4.0	662.329895	.000016	0.00002416
4.1	662.329893	.000014	0.00002114
4.2	662.329891	.000012	0.00001812

Test Arrangement for Temperature Stability:

Frequency Counter Temperature chamber

The measurement procedure outlined below shall be followed:

Steps 1: The transmitter shall be installed in an environmental test chamber whose temperature is controllable. Provision shall be made to measure the frequency of the transmitter.

Step 2: With the transmitter inoperative (power switched "OFF"), the temperature of the test chamber shall be adjusted to +25°C. After a temperature stabilization period of one hour at +25°C, the transmitter shall be switched "ON" with standard test voltage applied.

Step 3: The carrier shall be keyed "ON", and the transmitter shall be operated unmodulated at full radio frequency power output at the duty cycle, for which it is rated, for a duration of at least 5 minutes. The radio frequency carrier frequency shall be monitored and measurements shall be recorded.

Step 4: The test procedures outlined in Steps 2 and 3, shall be repeated after stabilizing the transmitter at the environmental temperatures specified, -30°C to 50°C in 10 degree increments.

Specific Measurement Procedure

The temperature tests were performed in a Delta Design Model 7600 CDT environmental test chamber. The transmitter antenna was replaced with an adapter cable setup. The cable passed through a porthole in the chamber to the ADVANTEST R3361A spectrum analyzer operating in the frequency counting mode. The cable also physically supported the transmitter when it was being cooled, and when it was transmitting.

For temperatures less than 20 centigrade, a block of dry ice was used to produce the cooling. The transmitter minus battery power was suspended between the block of dry ice and its paper bag in order to achieve 10 centigrade, step temperatures required by 2.1055.

In order to monitor the transmitter's temperature, a thermocouple was black-taped on the side of the transmitter opposite the dry ice. Typically, it would take approximately 1 minute to reach each Two 2-inch foam insulation was used to provide some insulation from the chamber door.

Transmitter

After the transmitter temperature dropped 10□ C step, the battery was connected to the transmitter to cause it to begin transmitting and the chamber door quickly closed. For all practical purposes, the transmitter frequency would stabilize immediately. The frequency stabilization time was extremely short compared to the time it took the transmitter and battery to return to the target temperature after the door was closed.

The Advantest R3361A spectrum analyzer used the following settings:

ATT = 50dB, REF = 20 dBm, RBW = 100 kHz, VBW = 100 kHz, Span = 10MHz, SWP = 50ms, 10dB/.

The measurement results are stated in the table below.

Section 74.861(4) requires the frequency stability to be within 0.005% from nominal for temperature variation.

Measurement Results

662MHz

°C	MHz	Deviation from Nominal	%
-30	662.329000	.000885	0.00133619
-20	662.336000	.006115	0.00092325
-10	662.329000	.000885	0.00133619
0	662.329769	.0000116	0.00001751
10	662.305298	.00245871	0.00371235
20	662.329885	0	0.00000000
30	662.329902	.000017	0.00002567
40	662.329886	.000001	0.00000151
50	662.329983	.000098	0.00014796