Tactical Technologies Inc.

500 Pine St, Ste 3A
Holmes Corp Ctr
Holmes, PA 19043
TEL 610-522-0106
FAX 610-522-9430

Part 90 Testing

Model CTR75XWT
For Occupational Exposure Environment
Law Enforcement Use Only
One Channel Synthesized FM Voice Transmitter

FCC ID: IP9J1W

Tactical Technologies Inc.
500 Pine St. Ste 3A
Holmes Corp. Center
Holmes, PA 19043
610-522-0106

July 30, 2009

The audio frequency response, low pass filter test, occupied bandwidth, frequency stability, transient behavior, and modulation testing in this application for FCC Type Certification have been performed under my direct supervision. To the best of my knowledge these tests were conducted in accordance with the procedures outlined in Part 2 and Part 90 of the Commission's Rules and Regulations.

I am presently employed by Tactical Technologies Inc. in Folsom, Pennsylvania as a Design Engineer. My prior experience consists of 20 years of designing and testing communications products in the VHF portion of the spectrum.

Sincerely,

Jeffrey N. Olsen
Engineer
Tactical Technologies Inc.

A. INTRODUCTION

The following data are submitted in connection with this Application for Type Certification in accordance with Part 2, and Part 90, and I of the FCC Rules and Regulations.

B. INFORMATION REQUIRED BY PART 2

2.1003(a) See Form 731

2.1033(b) N/A

2.1003(c)

(1) The full name and address of the applicant and manufacture for certification is:
Tactical Technologies Inc.
500 Pine Street Suite 3A.
Holmes Corp. Center
Holmes, Pa. 19043

(2) The FCC Identifier of this device is IP9J1W

(3) Emission: NBFM Voice – 11K2F3

(4) Frequency Range 150 – 174 Mhz

(5) Output Power of the device is 900mw. @ 9.0 Volts

(6) Maximum Power Rating is 900mw.

(7) All of the Pre-amp sections run off of regulated +5.0 Volts, and the RF Final transistors runs on 9.0 Volts.

(8) Block diagram is included in the Exhibits.

(9) Test Data required by Part 2.1046 through 2.1057, inclusive, is measured in accordance with the procedure in Part 2.1041.

C. SUBMISSION OF EQUIPMENT FOR TESTING - Paragraph 2.943
Upon request, the test sample will promptly be made available by Radiation Science Inc.

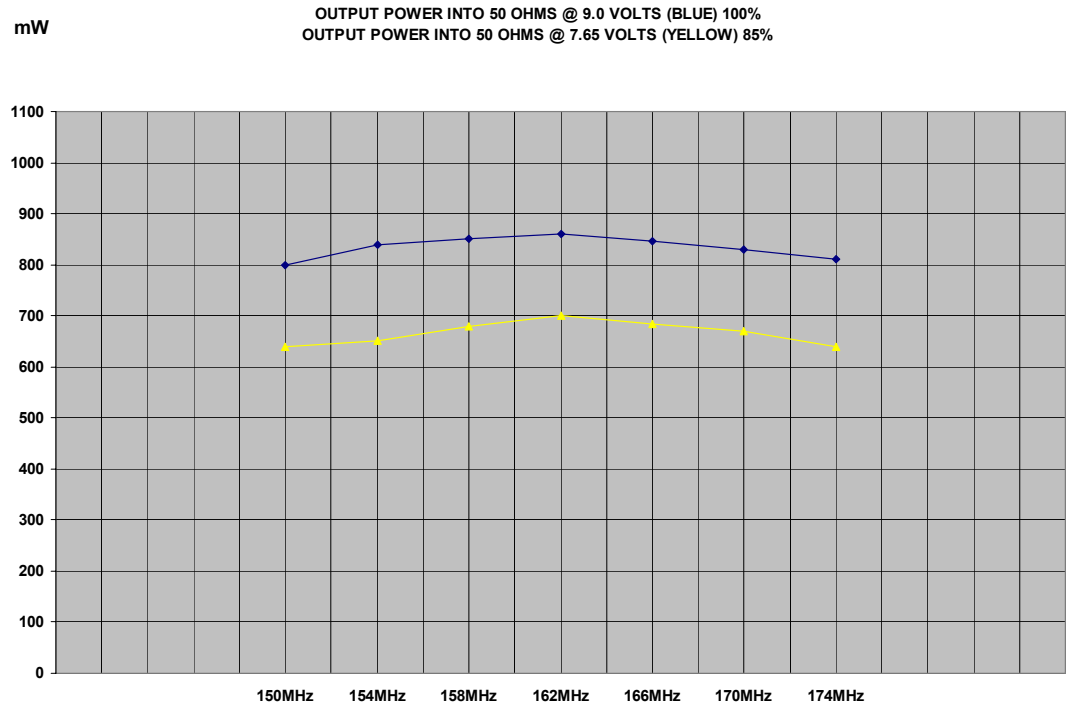
D. DESCRIPTION OF MEASUREMENT FACILITIES - Paragraph 2.947

The open-field tests were performed on the 3 meter range maintained by Radiation Science Inc. Complete description and measurement data have been placed on file with the Commission.

E. TEST DATA

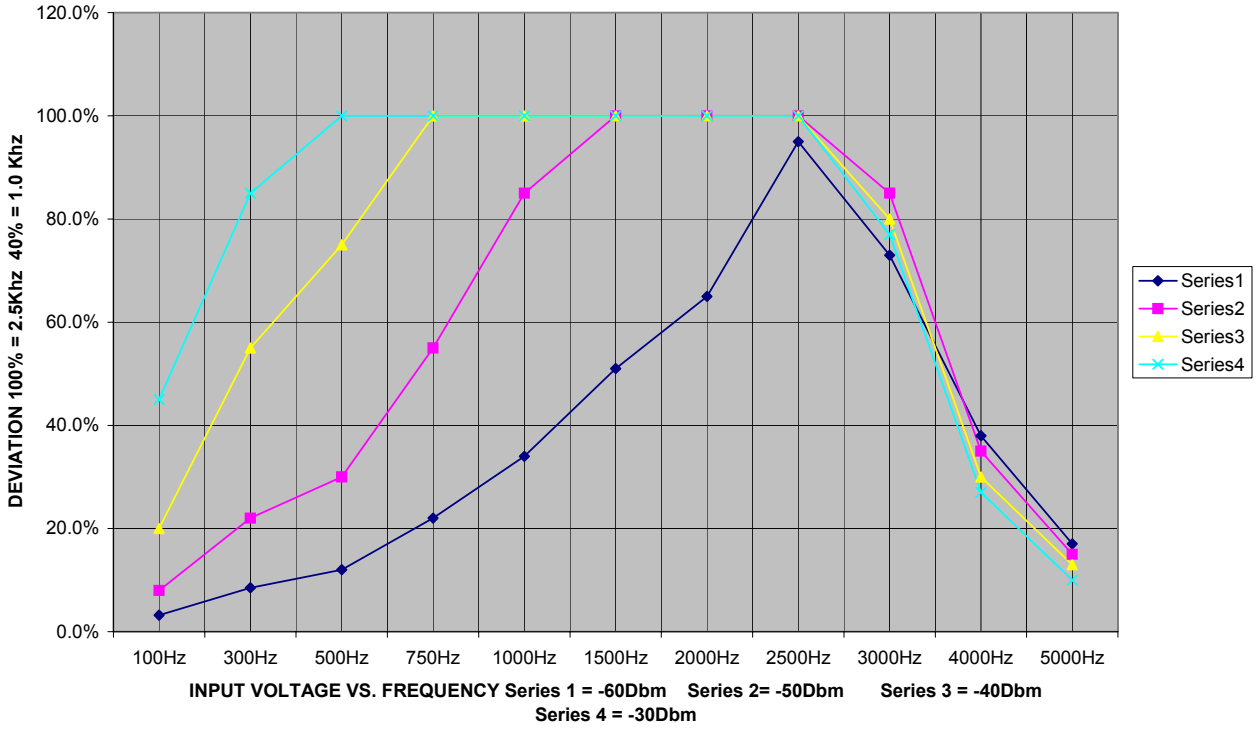
This section contains results of measurements required by Parts 2 and 90 of the rules. Data are presented in tabular and/or graphical form, and measurement procedures are described within the text of each reported test. The test sample operated on 3 frequencies in the 150 – 174 MHz range.

1. RF POWER OUTPUT - Paragraphs [2.1046(a), 2.1033(c),(8),90.205(d)]
Measurements pertaining to the power output of the transmitter were performed by the manufacturer. To the best of my knowledge, these tests were conducted in accordance with the procedures outlined in Parts 2 and 90 of the Commissions Rules and regulations.



2. MODULATION CHARACTERISTICS - Paragraph [2.1047(a), 90.211(a)]
Measurements pertaining to the modulation characteristics were performed by the manufacture. To the best of my knowledge, these tests were conducted in accordance with the procedures outlined in Parts 2 and 90 of the Commission's Rules and regulations.

INPUT SIGNAL LEVEL VS. DEVIATION CST800/V FCC ID # IP9800V
V



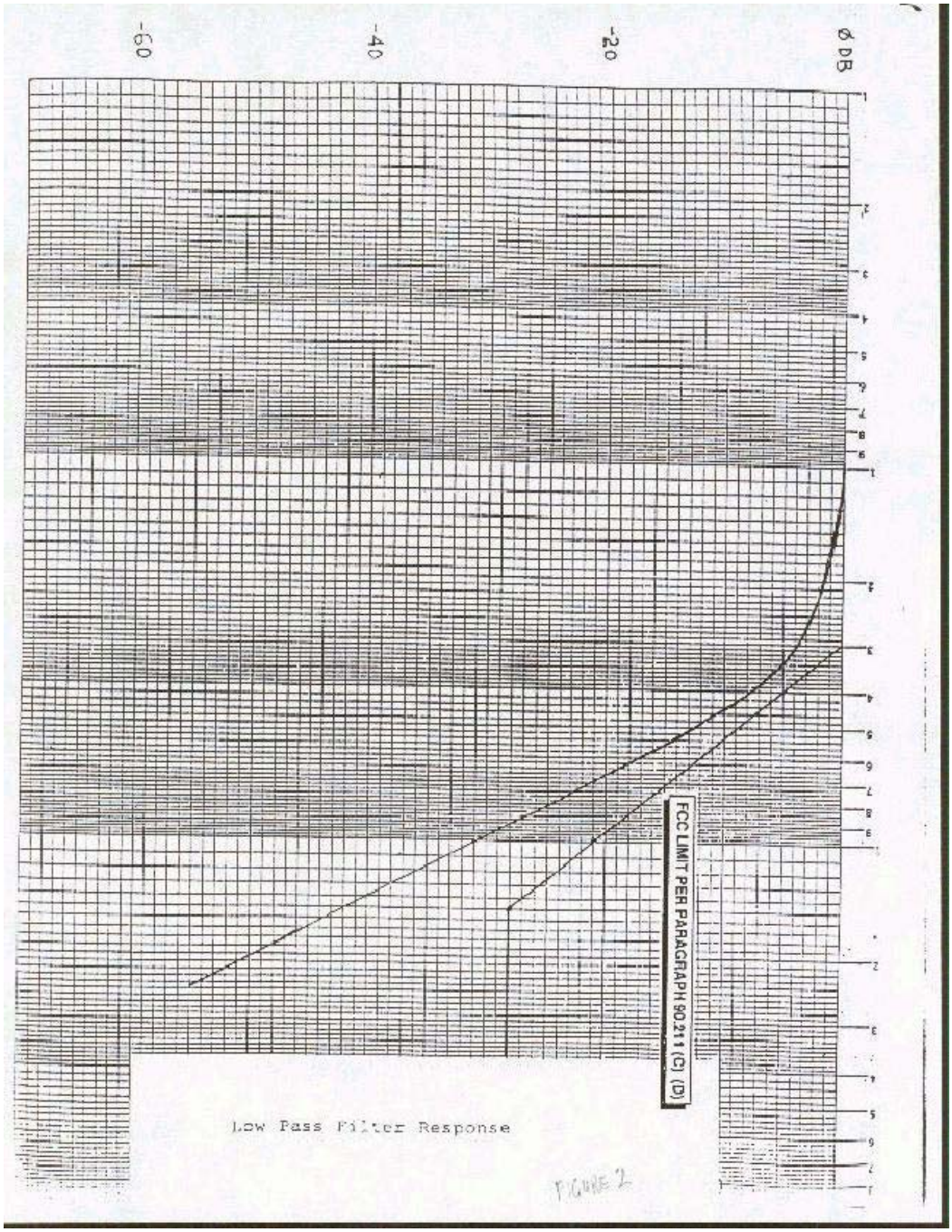
INPUT VOLTAGE VS. FREQUENCY Series 1 = -60Dbm Series 2= -50Dbm Series 3 = -40Dbm
Series 4 = -30Dbm

Audio Pre-Emphasis and Low Pass Filter vs. Input Signal

Input Signal Level -60 dBm Frequency Hz	Output Level	Pre-Emphasis 6Dbm/Octive Scaled +1/-3	Low Pass Filter 12 dBm/Octave
300	400mvpp	-15.3Dbm	-10.24Dbm	.
500	600mvpp	-11.7Dbm	-6.71Dbm	.
750	1100mvpp	-6.5Dbm	-1.45Dbm	.
1000	1300mvpp	-5.1Dbm	0.00Dbm	.
1500	1800mvpp	-2.3Dbm	+2.82Dbm	.
2000	2000mvpp	-1.3Dbm	+3.74Dbm	.
2500	3250mvpp	+2.8Dbm	+7.95Dbm	.
2700	4000mvpp	+4.7Dbm	+9.76Dbm	.
3000	3500mvpp	+3.5Dbm	+8.60Dbm	.

Low Pass Filter	
4000	-9.00Dbc
5000	-16.00Dbc
6000	-22.00Dbc
7000	-27.00Dbc
8000	-31.00DBC
9000	-35.00Dbc
10000	-38.00Dbc
15000	-50.00Dbc
20000	-60.00Dbc

All audio distortion measurements at the above frequencies were less than 10%. Distortion measurements were made with a B&W Model 400 Distortion Meter. Audio output measurements were made with a Tektronix Oscilloscope OS-245 and a Hewlett Packard 3551A Audio generator. All low pass filter measurements were made applying an audio generator to the microphone input, and monitoring the output of the transistor on a Hewlett Packard 8558B Spectrum Analyzer at 5 kHz bandwidth.



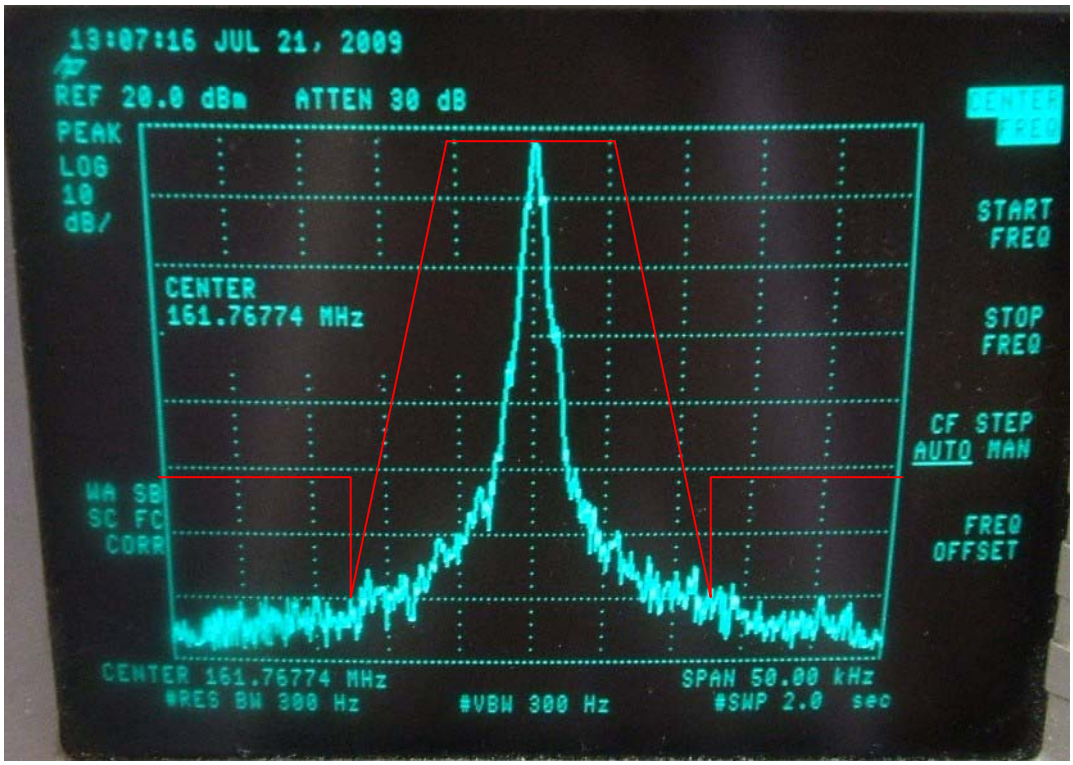
Low Pass Filter Response

FIGURE 2

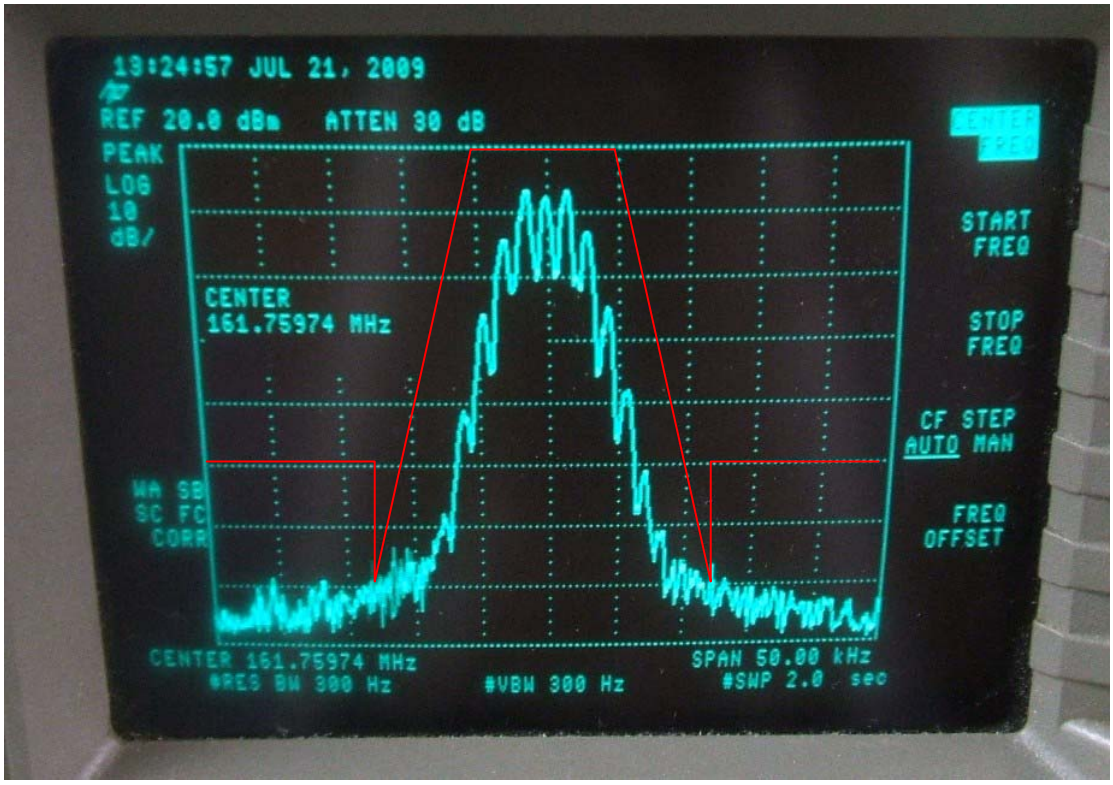
3. OCCUPIED BANDWIDTH - Paragraphs [2.1049, 90.211(a)]

The transmitter was modulated with a sine wave tone at 2500 Hz at a level 16 dB above the required to produce 50% modulation at the frequency maximum response. Paragraph 90.210(d) requires that the mean power of emissions shall be attenuated below the mean output power of the transmitter by the following amounts:

-- On any frequency removed from the center of the authorized bandwidth f0 to 5.625 khz removed from f0; Zero db.
-- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in khz) of more than 5.625 khz but no more than 12.5 khz. At least (fd – 2.88khz)db.
-- On any frequency removed from the center of the authorized Bandwidth by a displacement frequency (fd in khz) of no more than 12.5 khz. At least 50 + log(P) or 70db, whichever is the lesser attenuation.



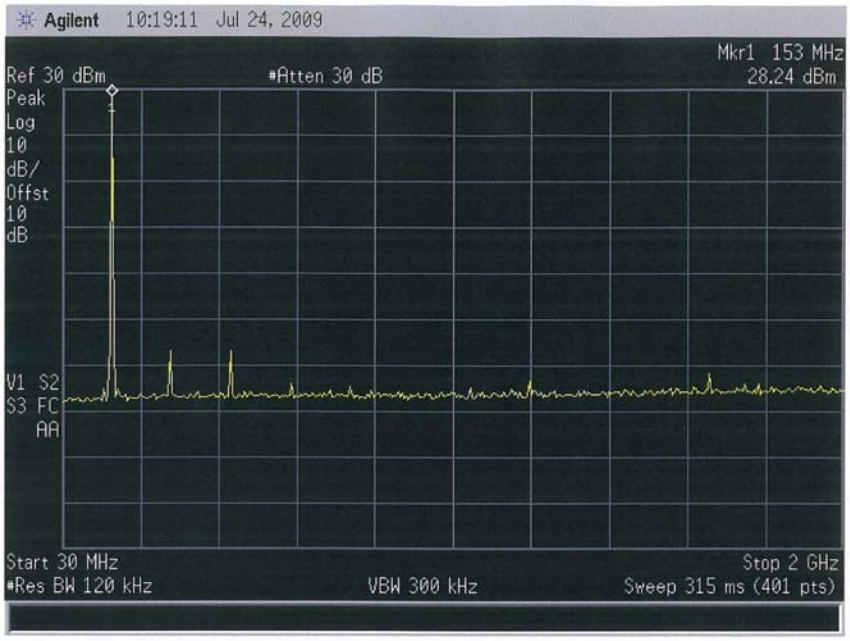
Unmodulated


13:24:57 JUL 21, 2009
REF 20.0 dBm
ATTEN 30 dB
PEAK
LOG
10
dB/
CENTER
161.75974 MHz
START
FREQ
STOP
FREQ
CF STEP
AUTO MAN
FREQ
OFFSET
MA SB
SC FC
CORR
CENTER 161.75974 MHz
#RES BW 300 Hz
#VBW 300 Hz
SPAN 50.00 kHz
#SWP 2.0 sec

Modulated

4. SPURIOUS EMISSIONS AT THE 50 OHM TEST POINT ON THE TRANSMITTER [2.1053, 90.209 Emission Mask D]

The spectrum was checked with the spectrum analyzer from 30 MHz to the 10th harmonic of the carrier frequency. Observed emissions not reported are attenuated more than 20 dB below the permissible value. 47 + log (1W) = 50 dB given by Section 90.209. The below plots verifies that the test sample complies with Paragraph 90.209(c)(3).

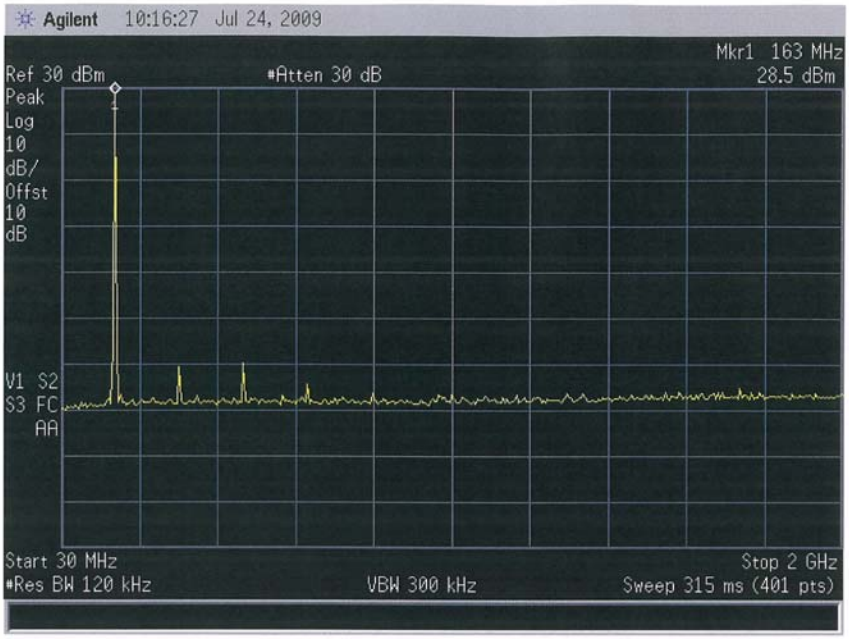


FCC Part 2, Antenna Conducted Emissions
Continuous Transmission on 150.4125 MHz

Customer	Tactical Technologies	
Test Sample	Synthesized Narrowband FM Transmitter	
Model / S/N	CTR75XWT / 101	
Date: 7-24-09	Tech: R. Wilson	Sheet 1 of 3

Retlif Testing Laboratories

Test Report No. {R-XXXX}

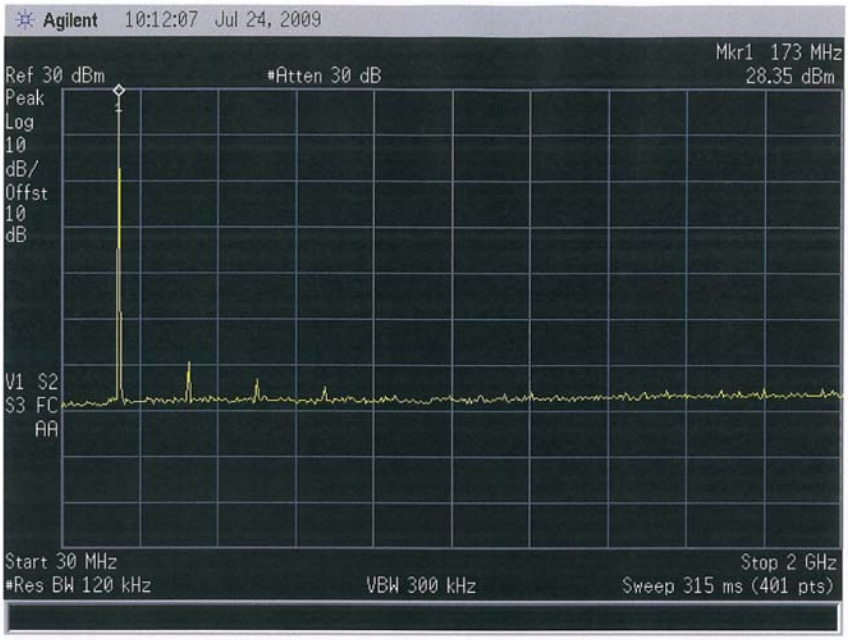


FCC Part 2, Antenna Conducted Emissions
Continuous Transmission on 162.9125 MHz

Customer	Tactical Technologies	
Test Sample	Synthesized Narrowband FM Transmitter	
Model / S/N	CTR75XWT / 101	
Date 7-24-09	Tech: R. Wilson	Sheet 2 of 3

Retlif Testing Laboratories

Test Report No. {R-XXXX}

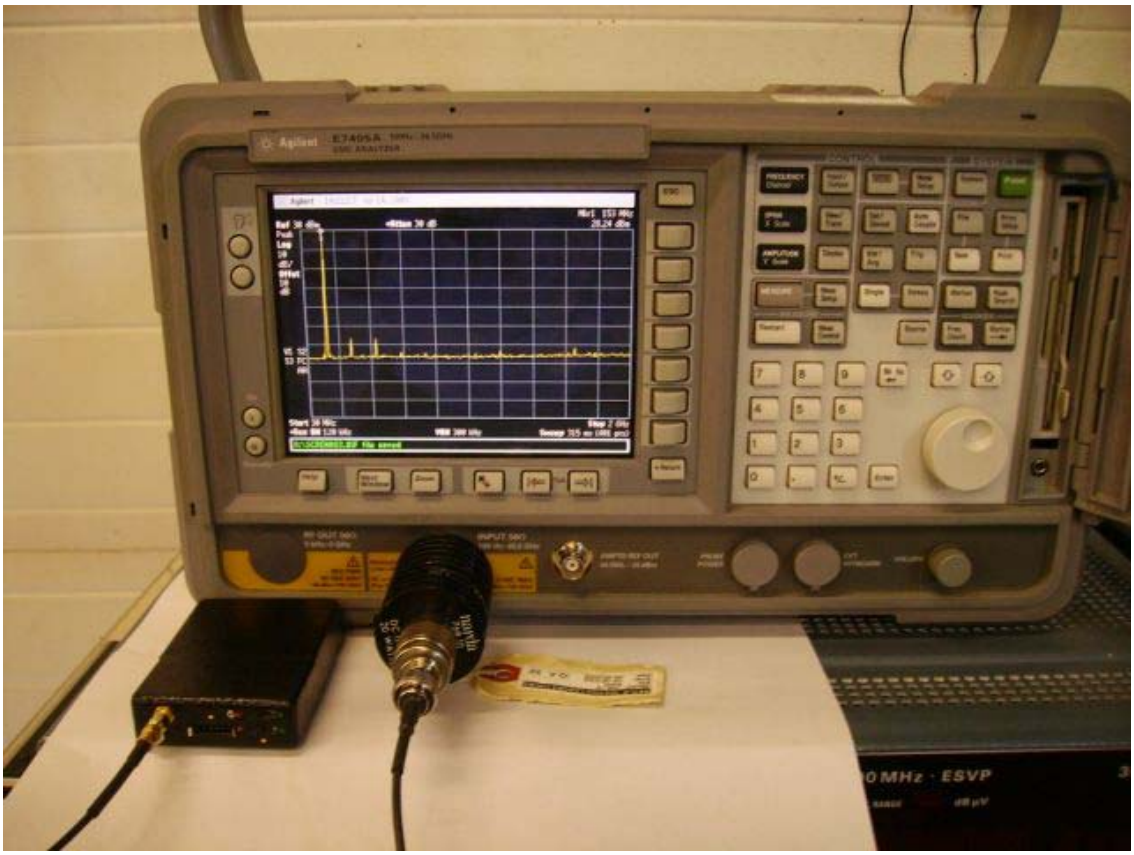


FCC Part 2, Antenna Conducted Emissions
Continuous Transmission on 173.9500 MHz

Customer	Tactical Technologies	
Test Sample	Synthesized Narrowband FM Transmitter	
Model / S/N	CTR75XWT / 101	
Date: 7-24-09	Tech: R. Wilson	Sheet 3 of 3

Retlif Testing Laboratories

Test Report No. {R-XXXX}



5. FIELD STRENGTH OF SPURIOUS RADIATION - Paragraphs [2.1053, 90.209]

Measurements were made on the three meter range maintained by Radiation Science Inc. to quantify spurious emission level that are radiated directly from the cabinet, control circuits, power leads and intermediate circuit elements under normal conditions of installation and operation. Particular attenuation was paid to harmonics of the carrier frequency as well as those frequencies removed from the carrier by multiples of the oscillator frequency.

The test sample was placed on a non-conductive table one meter above the ground plane in order to determine the maximum level at each emission radiated into a non-radiating 50 ohm dummy load and supplied antenna. Both horizontal and vertical site antenna polarization were employed. The antenna was raised 1 to 4 meters in height and the equipment under test was rotated 360 degrees to minimize the emission. All radiated Spurious Emissions were greater than 20 dbm below the FCC Limit with the non-radiating 50 ohm dummy load.

Test Method:	**FCC Part 2, Radiated Spurious Emissions, 30 MHz to 2.0 GHz**		
Customer:	Tactical Technologies	**Job No.:**	R-1399P
Test Sample:	Synthesized Narrowband FM Transmitter		
Model No.:	CTR75XWT	**Serial No.:**	101
FCC ID No.:	IP9J1W		
Operating Mode:	Continuous Transmission at 150.4125MHz		
Technician:	R. Wilson	**Date:**	7-24-09

Notes: Test Distance: 3 Meters Temp: 27°C RH: 51%
Detector: Peak

Frequency	Antenna Position	EUT Azimuth	Meter Readings	Correction Factor	Corrected Reading	Corrected from Fundamental	Limit
MHz	(V/H) / Meters	Degrees	dBm	dB	dBm	dBm	dBm
150.4125	H / 1.0	180	-18.6	10.0	-8.6		
150.4125	V / 1.0	180	-0.3	10.0	9.7		
300.8250	H / 1.0	180	-67.2	15.5	-51.7	-61.4	-50.0
300.8250	V / 1.3	180	-63.0	15.5	-47.5	-57.2	-50.0
451.2375	H / 1.0	180	-76.4	18.8	-57.6	-67.3	-50.0
451.2375	V / 1.5	180	-65.3	18.8	-46.5	-56.2	-50.0
601.6500	H / 1.0	180	-67.0	22.1	-44.9	-54.6	-50.0
601.6500	V / 1.0	180	-73.0	22.1	-50.9	-60.6	-50.0
752.0625	H / 1.0	180	-85.4	24.3	-61.1	-70.8	-50.0
752.0625	V / 1.3	180	-77.6	24.3	-53.3	-63.0	-50.0

The frequency range was scanned from 30 MHz to 2 GHz.
The emissions observed from the EUT do not exceed the specified limits.
All emissions not recorded were more than 20dB below the specified limit.

Test Method:	**FCC Part 2, Radiated Spurious Emissions, 30 MHz to 2.0 GHz**		
Customer:	Tactical Technologies	**Job No.:**	R-1399P
Test Sample:	Synthesized Narrowband FM Transmitter		
Model No.:	CTR75XWT	**Serial No.:**	101
FCC ID No.:	IP9J1W		
Operating Mode:	Continuous Transmission at 162.9125MHz		
Technician:	R. Wilson	**Date:**	7-24-09

Notes: Test Distance: 3 Meters Temp: 27°C RH: 51%
Detector: Peak

Frequency	Antenna Position	EUT Azimuth	Meter Readings	Correction Factor	Corrected Reading	Corrected from Fundamental	Limit
MHz	(V/H) / Meters	Degrees	dBm	dB	dBm	dBm	dBm
162.9125	H / 1.0	180	-17.3	10.0	-7.3		
162.9125	V / 2.9	180	5.0	10.0	15.0		
325.8250	H / 1.0	180	-67.9	15.5	-52.4	-67.4	-50.0
325.8250	V / 2.0	180	-51.6	15.5	-36.1	-51.1	-50.0
488.7375	H / 1.0	180	-66.3	19.7	-46.6	-61.6	-50.0
488.7375	V / 2.8	180	-61.3	19.7	-41.6	-56.6	-50.0
651.6500	H / 1.0	180	-68.1	23.0	-45.1	-60.1	-50.0
651.6500	V / 1.7	180	-67.3	23.0	-44.3	-59.3	-50.0
814.5600	H / 1.0	180	-69.4	25.1	-44.3	-59.3	-50.0
814.5600	V / 1.0	180	-69.0	25.1	-43.9	-58.9	-50.0

The frequency range was scanned from 30 MHz to 2 GHz.
The emissions observed from the EUT do not exceed the specified limits.
All emissions not recorded were more than 20dB below the specified limit.

Test Method:	**FCC Part 2, Radiated Spurious Emissions, 30 MHz to 2.0 GHz**		
Customer:	Tactical Technologies	**Job No.:**	R-1399P
Test Sample:	Synthesized Narrowband FM Transmitter		
Model No.:	CTR75XWT	**Serial No.:**	101
FCC ID No.:	IP9J1W		
Operating Mode:	Continuous Transmission at 173.9500MHz		
Technician:	R. Wilson	**Date:**	7-24-09

Notes: Test Distance: 3 Meters Temp: 27°C RH: 51%
Detector: Peak

Frequency	Antenna Position	EUT Azimuth	Meter Readings	Correction Factor	Corrected Reading	Corrected from Fundamental	Limit
MHz	(V/H) / Meters	Degrees	dBm	dB	dBm	dBm	dBm
173.9500	H / 1.0	180	-16.7	10.6	-6.1		
173.9500	V / 2.5	180	2.8	10.6	13.4		
347.9000	H / 1.0	180	-66.6	17.2	-49.4	-62.8	-50.0
347.9000	V / 2.5	180	-57.3	17.2	-40.1	-53.5	-50.0
512.8500	H / 1.0	180	-72.3	19.8	-52.5	-65.9	-50.0
512.8500	V / 1.0	180	-71.6	19.8	-51.8	-65.2	-50.0
695.8000	H / 1.0	180	-71.7	24.5	-47.2	-60.6	-50.0
695.8000	V / 1.4	180	-69.2	24.5	-44.7	58.1	-50.0

The frequency range was scanned from 30 MHz to 2 GHz.
The emissions observed from the EUT do not exceed the specified limits.
All emissions not recorded were more than 20dB below the specified limit.

Photos of the unit under test at 3 meters.

EQUIPMENT LIST

FCC Part 2, Radiated Spurious Emissions, 30MHz to 2.0GHz

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due
8076	Spectrum Analyzer	Hewlett Packard	100 Hz - 1.5 GHz	8568B	8/15/2008	8/15/2009
8077	Spectrum Analyzer	Hewlett Packard		85662A	8/15/2008	8/15/2009
8080	Receiver	Rohde & Schwarz	20-1300 MHz	ESVP	5/20/2009	5/20/2010
8300	OATS Site NSA	RSI	3/10 Meter Site		8/15/2008	8/15/2009
8300B	OATS Cable				9/10/2008	9/10/2009
8356	10.0 dB Attenuator	Narda	DC - 11 GHz, 20 W	768-10	9/11/2008	9/11/2009
8365	Biconilog	EMCO	26 MHz - 3 GHz	3142C	9/12/2007	9/12/2009
8411	Preamplifier	Sonoma Instrument	9 kHz - 1 GHz	310N	9/23/2008	9/23/2009
R603	Spectrum Analyzer	Agilent	100 kHz - 26.5 GHz	E7405A;B	5/12/2009	5/12/2010

6. FREQUENCY STABILITY - Paragraphs 2.1055, 90.213, 90.214

Measurements of frequency stability versus temperature were made at temperatures ranging from -30 degrees C to +50 degrees C. At each temperature, the unit was exposed to the test chamber ambient for a minimum of 30 minutes after the temperature had stabilized within plus or minus one degree of the desired temperature. Following a 30 minute "soak" at each temperature, the frequency was measured within one minute after application of power. The test temperature was sequenced in the order shown below starting at -30 degrees Celsius. The nominal primary power supply voltage of 9.0 vdc was used, and the frequency was measured with a Hewlett Packard 5253B Frequency Counter.

FREQUENCY STABILITY VS. TEMPERATURE

TEMPERATURE C	FREQUENCY MHz
-30	173.949784
-20	173.949846
-10	173.949880
0	173.949915
+10	173.949978
+20	173.950027
+30	173.950081
+40	173.950123
+50	173.950157

The values are within 5 ppm (.000869 MHz) of the assigned frequency (173.950 MHz) as stated in Paragraph 90.213. Thus, the test sample complies with Paragraph 90.213.

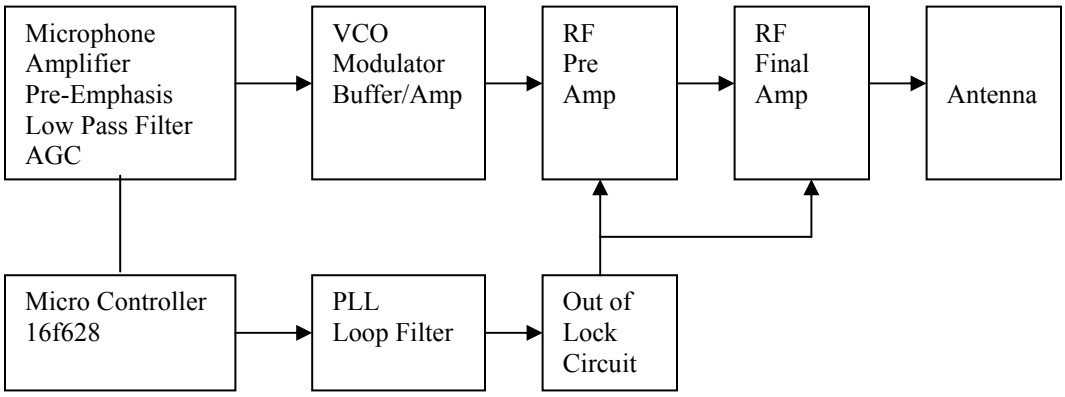
The output frequency as a function of supply voltage was measured, and the results are given below.

FREQUENCY STABILITY
POWER SUPPLY VOLTAGE VS. OUTPUT FREQUENCY

POWER SUPPLY VOLTAGE (%)	(Vdc)	OUTPUT FREQUENCY (MHz)
115	10.35	173.950027
100	9.00	173.950027
85	7.65	173.950027

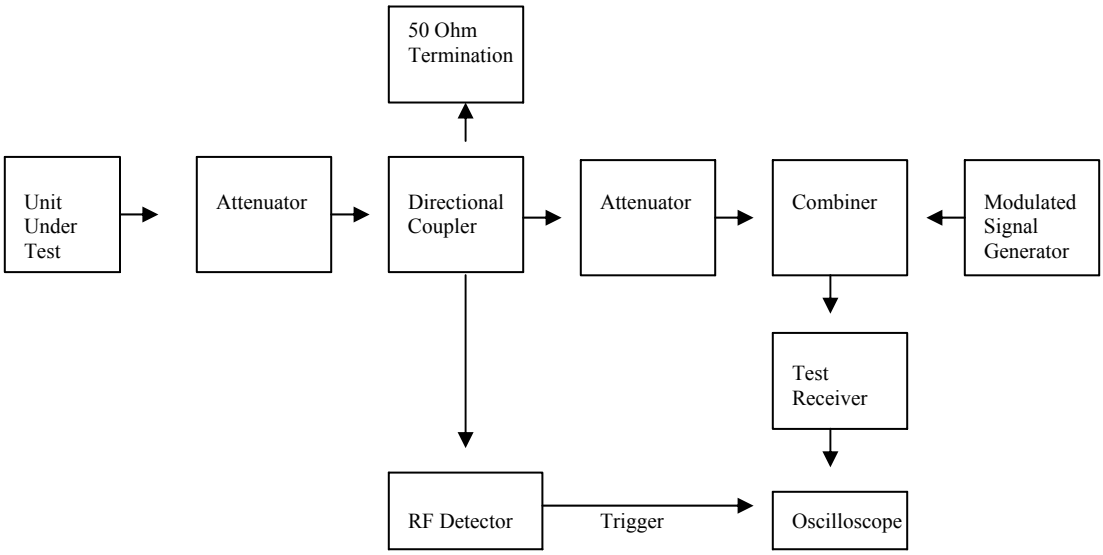
These values are within 5 ppm of the assigned frequency. The test sample complies with Paragraph 90.213.

Model CTR75XWT
FCC: IP9J1W
Block Diagram



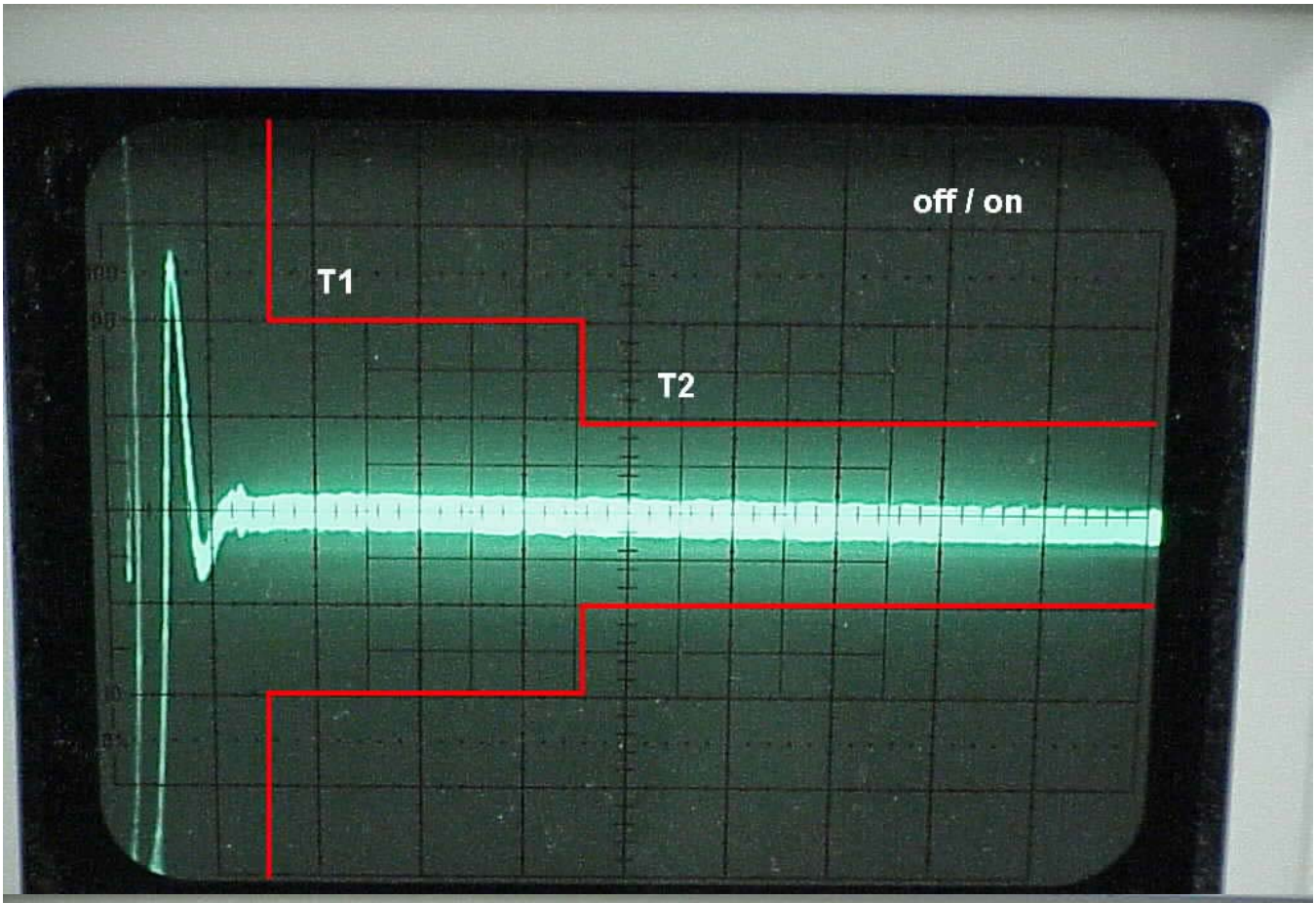
BLOCK DIAGRAM
MODEL CTR75XWT
FCC ID: IP9J1W

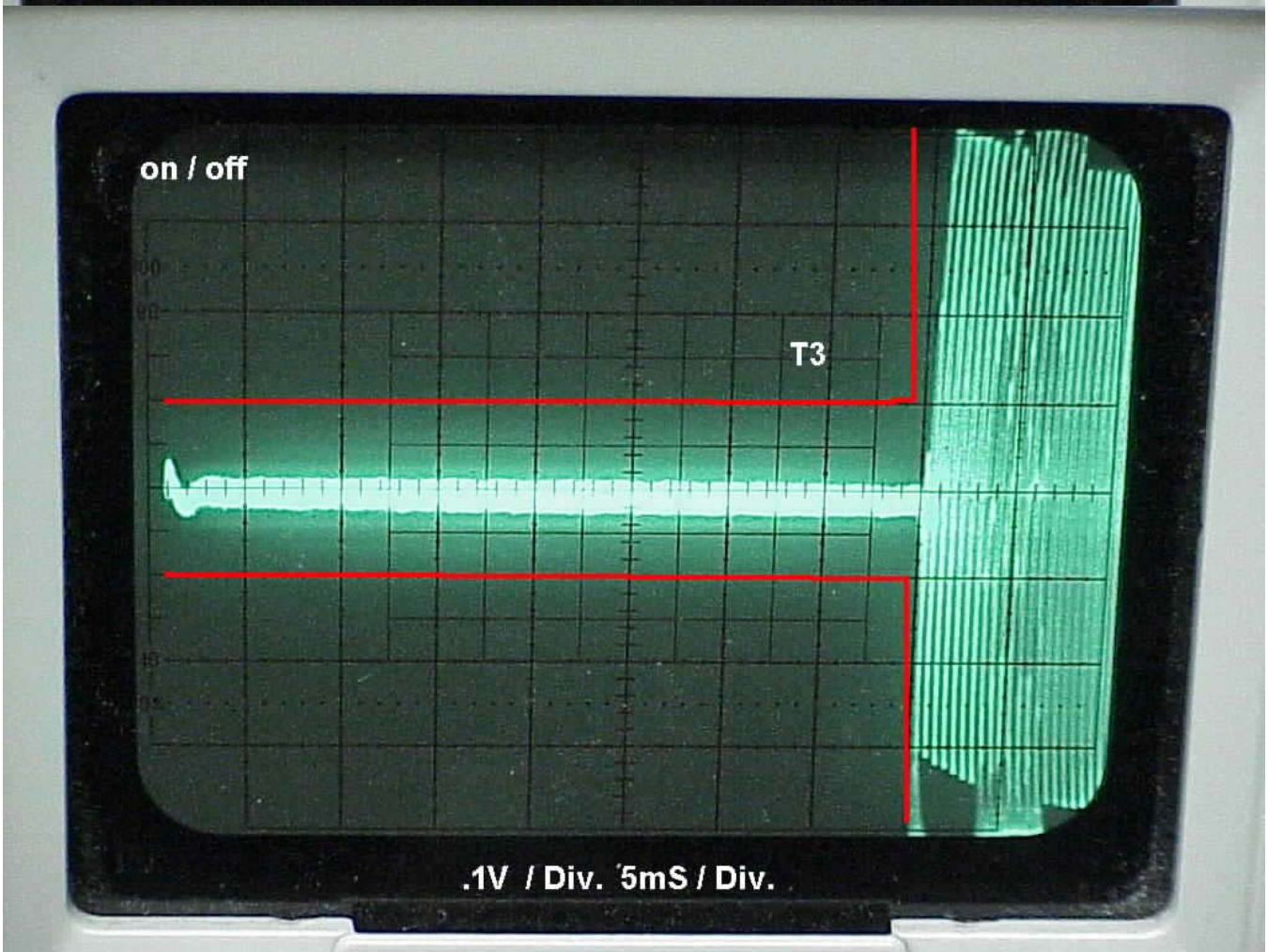
Transient Frequency Behavior 90.214



The unit under test (IP9J1W) was connected to a Directional Coupler. The two outputs from the coupler were connected to a RF Detector Diode and the other output from the coupler was combined with a 25 kHz FM modulated test signal. The output from the combiner was connected to a test receiver, the demodulated audio from the receiver was connected to the oscilloscope input and the external trigger input on the oscilloscope was connected to the output of the RF diode detector. Power was applied to the test unit from a power supply, and the unit was turned OFF/ON manually with a test lead applied to the positive terminal of the power supply.

Three time periods were captured on the storage oscilloscope and recorded. The two pictures below show the turn on and turn off points and the related frequency displacement. The t1 and t2 mask limits are superimposed on the TOP photograph (ON to OFF), and the t3 mask limit is superimposed on the BOTTOM photograph (OFF to ON).


off / on
T1
T2


on / off
T3
.1V / Div. 5mS / Div.

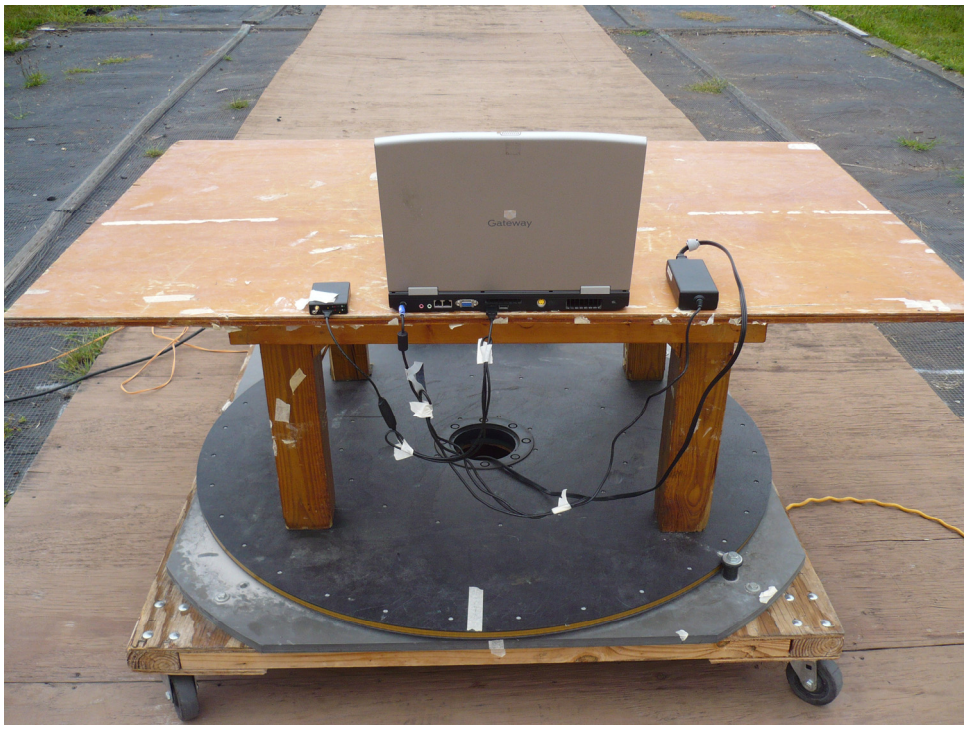
Power Output, Antenna Substitution Method
Test Data

Test Method:	**Power Output, Antenna Substitution Method**		
Customer:	Tactical Technologies	**Job No.:**	R-1415P
Test Sample:	Synthesized Narrowband FM Transmitter		
Model No.:	CTR75XWT	**Serial No.:**	101
Operating Mode:	Continuous Transmission at 162.9125MHz		
Technician:	R. Wilson	**Date:**	8-27-09

Notes: Test Distance: 3 Meters Temp:25 °C RH: 40%

Frequency	Antenna Position	Generator Output Power to Diople Ant.	Receive Antenna Meter Reading	Converted Reading	Limit
MHz	(V/H) / Meters	dBm	dBm	mW	mW
162.9125	V / 1.0	29.2	15.0	831.0	905.0

Test Photograph(s)
FCC Part 15.109(a) Radiated Emissions



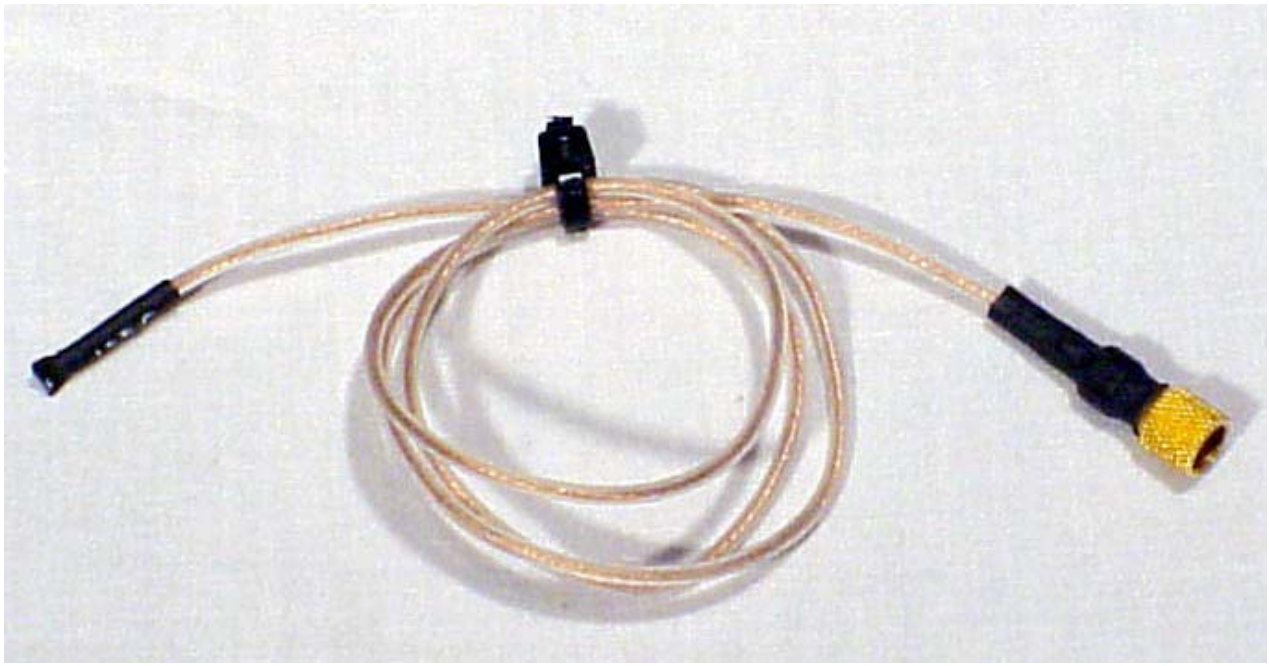
EUT Configuration

Biconical Antenna Substitution Method Test Setup

Equipment List

FCC Part 15.109(a) Radiated Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
8076	Spectrum Analyzer	Hewlett Packard	100 Hz - 1.5 GHz	8568B	8/15/2008	9/15/2009
8077	Spectrum Analyzer	Hewlett Packard		85662A	8/15/2008	9/15/2009
8080	Receiver	Rohde & Schwarz	20-1300 MHz	ESVP	5/20/2009	5/20/2010
8163	Antenna	EMCO		3121	8/28/2007	8/28/2009
8300	OATS Site NSA	RSI	3/10 Meter Site		8/15/2008	9/15/2009
8300B	OATS Cable				9/10/2008	9/10/2009
8314	Signal Generator	Aeroflex	9 kHz - 2.05 GHz	2023B	2/5/2008	2/5/2010
8365	Biconilog	EMCO	26 MHz - 3 GHz	3142C	9/12/2007	9/12/2009
8411	Preamplifier	Sonoma Instrument	9 kHz - 1 GHz	310N	9/23/2008	9/23/2009



IP9J1W antenna

The antenna is constructed with a piece of RG-174 coax with the shield and jacket removed from the cable. The total length of the antenna is 18 inches long, mated with a 50 ohm connector at one end.

The unit was tested at 3 frequencies:

Freq.	Power @3m	Power in 50 ohms	
150 MHz	+9.7 dBm	800mW	+29.03 dBm
162 MHz	+15 dBm	865mW	+29.37 dBm
174 MHz	+13.4 dBm	825mW	+29.16 dBm

The IP9J1W maximum radiated power @ 3 meters was at 162 MHz. The measured value was +5.0 dBm by adding .5 dBm for the rx cable loss and 9.5 dBm for the rx antenna correction factor the final power into the spectrum analyzer was +15.0 dBm. Using the antenna substitution method a dipole antenna cut at 162 MHz was used to replace the IP9J1W. A RF signal generator was connected to the dipole with a tx cable that had .5 dBm loss at 162Mhz. The RF generator was set at +.5dBm and the power to the dipole was 0 dBm. The same rx antenna was raised and lower to get the maximum reading on the spectrum analyzer. That value was -24.2 dBm by adding the .5 dBm cable loss and 9.5 dBm for the antenna correction factor the power was -14.2 dBm (path loss). To reproduce the same output power, the RF generator would be +15 dBm + -14.2 dBm = +29.2 dBm or 831 mw (ERP).