

**TYPE OF EXHIBIT:** TEST REPORT

**FCC PART:** 2.1033 (c)(14)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** May 11, 2001

Following is a list of attached exhibits required by the Federal Communications Commission for the application to and grant of FCC Certification.

Statement of Certifying Engineer .....	2.947
List of Test Equipment Used .....	2.947 (d)
Description of Measurement Facility .....	2.948
Required Measurements .....	2.1033 (c)(14)
Radio Frequency Power Output .....	2.1046
Modulator Response .....	2.1047 (a)
Speech Amplifier Low-Pass Filter Response .....	2.1047 (a)
Percent of Modulation vs. Modulation Input Voltage .....	2.1047 (b)
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Transient Frequency Behavior .....	90.214

**TYPE OF EXHIBIT:** STATEMENT OF CERTIFYING ENGINEER

**FCC PART:** 2.947

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** May 11, 2001

I, Michael A. Pickard, have been employed by RITRON, Inc. since November 1979, working in the Engineering Department since June 1981 as a radio frequency Project Engineer.

I hereby certify that all measurements and data herein were taken by me, that they were obtained using sound and accepted engineering principles, and that they accurately reflect the performance and characteristics of the units tested.

Signed:



Michael A. Pickard - Project Engineer

**TYPE OF EXHIBIT:** TEST EQUIPMENT LIST

**FCC PART:** 2.947 (d)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** May 11, 2001

The measured data in this report was obtained using one or more of the following pieces of equipment. The particular equipment used in any one test is detailed in the procedure for that test.

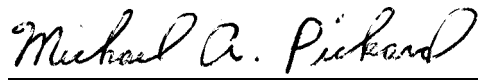
<u>ITEM</u>	<u>MANUFACTURER</u>	<u>MODEL NO.</u>	<u>SERIAL NO.</u>
Communications Test Set	IFR	COM-120B	500008863
Spectrum Analyzer	Hewlett-Packard	8554B	1502A 09103
Spectrum Analyzer	Hewlett-Packard	8559A	2010A 06979
Audio Sweep Generator	B & K Precision	4010	275-00893
Power Supply	BK/Precision	1630	146-01091
Power Supply	Astron	VS-20M	9608032
Digital Oscilloscope	Philips	PM-3335	DM648004
Dual Display Multimeter	Fluke	45	6723040
Digital VOM	Micronta	22-191	N/A
RF Wattmeter	Bird	6154	8652
Dipole Antenna	Electro-Metrics	EM-6924	241
Dipole Antenna	Electro-Metrics	BDA-25	8-101
Log Periodic Antenna	Electro-Metrics	LP-25	8-102
Microwave Test Antenna	Polarad	CA-B	11-3
Temperature Chamber	Associated Laboratories	ELH-0.5-LC	N/A
Thermocouple	Omega	7035-J-225	8504
30dB Power Attenuator	Bird	8306-300-N	N/A
10dB Attenuator	ELCOM	AT-51-10	N/A
20dB Attenuator	Tenuline	8340-200	1544
RF Detector	Microlabs/FXR	XA-1040	N/A

<b>TYPE OF EXHIBIT:</b>	DESCRIPTION OF MEASUREMENT FACILITY
<b>FCC PART:</b>	2.948
<b>MANUFACTURER:</b>	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
<b>MODEL:</b>	SST-442
<b>TYPE OF UNIT:</b>	UHF-FM Handheld Transceiver
<b>FCC ID:</b>	AIERIT13-442
<b>DATE:</b>	May 11, 2001

The Field Strength measurements filed with this application were made on a site certified by RITRON, Inc. Data pertaining to this site is on file with the FCC and is current.

This site is used exclusively by RITRON, Inc. and is utilized only for the RF Field Strength Measurements of equipment designed and manufactured by RITRON, Inc. It is NOT used for measurements by or for any other party on a contract basis or otherwise.

Signed:



Michael A. Pickard - Project Engineer

**TYPE OF TEST:** RADIO FREQUENCY POWER OUTPUT

**FCC PART:** 2.1046

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**PROCEDURE:**

1. The SST-442 was aligned for transmitter operation on 460.0125, 465.0125 and 470.0125 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual. This represents frequencies at the low, middle and high end of the SST-442 operating frequency band.
2. Power was supplied to the SST-442 via P302 by a BK Precision Model 1630 power supply. The SST-442 was connected at antenna terminal P201 to the input of a Bird 6154 Thermaline Wattmeter, used to measure RF power of the carrier.
3. A BK Model 2704A Digital Multimeter was connected in series with L206 to measure the collector current of Q205, the final RF amplifier device. A Micronta Model 22-191 Digital Multimeter was used to measure Q205 collector supply voltage at L206.
4. The SST-442 is equipped with a 6-cell AA NiCd battery pack that has a nominal voltage of 7.2 VDC and a maximum voltage of 8.4 VDC. Measurements were taken with the power supply set to 7.2 and 8.4 VDC.

**TYPE OF TEST:** RADIO FREQUENCY POWER OUTPUT

**FCC PART:** 2.1046

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

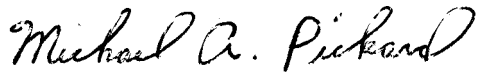
**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**TEST RESULTS:**

Frequency (MHz)	Battery Condition	Collector Voltage (VDC)	Collector Current (Amps)	Input Power (Watts)	Output Power (Watts)	Efficiency
460.0125	Nominal High	7.2	0.63	4.54	1.80	39.6%
		8.4	0.74	6.22	2.30	37.0%
465.0125	Nominal High	7.2	0.65	4.68	1.85	39.5%
		8.4	0.74	6.22	2.40	38.6%
470.0125	Nominal High	7.2	0.63	4.54	1.85	40.7%
		8.4	0.72	6.05	2.35	38.8%

Certifying Engineer:

  
Michael A. Pickard - Project Engineer

**TYPE OF TEST:** MODULATOR RESPONSE

**FCC PART:** 2.1047 (a)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**PROCEDURE:**

1. The SST-442 was aligned for transmitter operation on 465.0125 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.
2. The SST-442 speech amplifier was disconnected from the modulator at R349. The output of a BK Precision Model 4010 Function Generator was connected to R349 through a 100 $\mu$ F capacitor.
3. The SST-442 was connected at antenna terminal P201 to the 50 $\Omega$  RF input of the IFR COM-120B, which was used to measure FM deviation.
4. The audio signal generator was set to a frequency of 1000 Hz and the output was adjusted to provide +/- 1.5 kHz deviation (60% rated system deviation) as indicated by the IFR COM-120B. This output level was 103 mVAC.
5. With the audio generator output level fixed at 103 mVAC, the frequency was varied from 100 - 5000 Hz. Deviation was measured at various frequencies within this range and recorded on the accompanying chart.
6. A separate measurement was made for sub-audible tones. The audio signal generator was set for various sub-audible tones between 67 - 250 Hz at an output level of 30 mVAC, the level required to produce 500 Hz deviation at 67 Hz. There was no variation in resulting deviation across the sub-audible frequency range.

**TYPE OF TEST:** MODULATOR RESPONSE

**FCC PART:** 2.1047 (a)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**TEST RESULTS:**

Test Frequency: 465.0125 MHz  
Input Voltage required for 60% deviation at 1000 Hz: 103 mVAC

Modulation Frequency (Hz)	Frequency Deviation (+/- kHz)	Percent System Deviation
100	1.50	60.0%
200	1.50	60.0%
400	1.51	60.4%
800	1.51	60.4%
1000	1.50	60.0%
2000	1.49	59.6%
3000	1.48	59.2%
4000	1.49	59.6%
5000	1.49	59.6%

Certifying Engineer:

  
Michael A. Pickard - Project Engineer



**TYPE OF TEST:** SPEECH AMPLIFIER LOW-PASS FILTER RESPONSE

**FCC PART:** 2.1047 (a)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**PROCEDURE:**

1. The stages of the SST-442 speech amplifier prior to the low-pass filter were removed by disconnecting R344 from the output of limiting amplifier IC305B.
2. The output of a BK Precision Model 4010 Function Generator was applied to R344.
3. A Fluke Model 45 Dual Display Multimeter was used to measure the low-pass filter output at Pin 14 of IC303D.
4. The audio signal generator was set for a 1000 Hz sine wave at an output level of 1.55 VAC to produce -2.5 dB at the output of the low-pass filter. This level was selected to prevent limiting or distortion at any frequency. The Fluke Model 45 Dual Display Multimeter was set to make all measurements relative to this reference level.
5. The frequency of the audio signal generator was varied from 100 to 100 kHz with the output level constant. Measurements were recorded on the accompanying chart. All measurements were +/- relative to the -2.5 dB measured at 1000 Hz.

**TYPE OF TEST:** SPEECH AMPLIFIER LOW-PASS FILTER RESPONSE

**FCC PART:** 2.1047 (a)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442


**DATE:** March 30, 2001

**TEST RESULTS:**

Input Voltage required for -2.5 dB output at 1000 Hz: 1.55 VAC

Frequency (Hz)	Measured Amplitude (dB)	Relative Amplitude (dB)
100	-3.4	-1.0
200	-3.4	-0.9
300	-3.3	-0.8
400	-3.2	-0.8
500	-3.1	-0.7
600	-3.0	-0.5
800	-2.8	-0.3
1,000	-2.5	0.0
2,000	-5.4	-3.2
3,000	-13.1	-11.1
4,000	-19.7	-17.9
5,000	-25.2	-23.5
6,000	-30.0	-28.3
8,000	-38.0	-36.4
10,000	-44.5	-43.1
12,000	-50.1	-48.8
16,000	-60.1	-57.7
20,000	-64.9	-62.5
24,000	-69.2	-66.8
40,000	-70.1	-67.7
80,000	-70.4	-68.0
100,000	-70.4	-68.0

Certifying Engineer:

  
Michael A. Pickard - Project Engineer

**TYPE OF TEST:** SPEECH AMPLIFIER LOW-PASS FILTER RESPONSE

**FCC PART:** 2.1047 (a)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

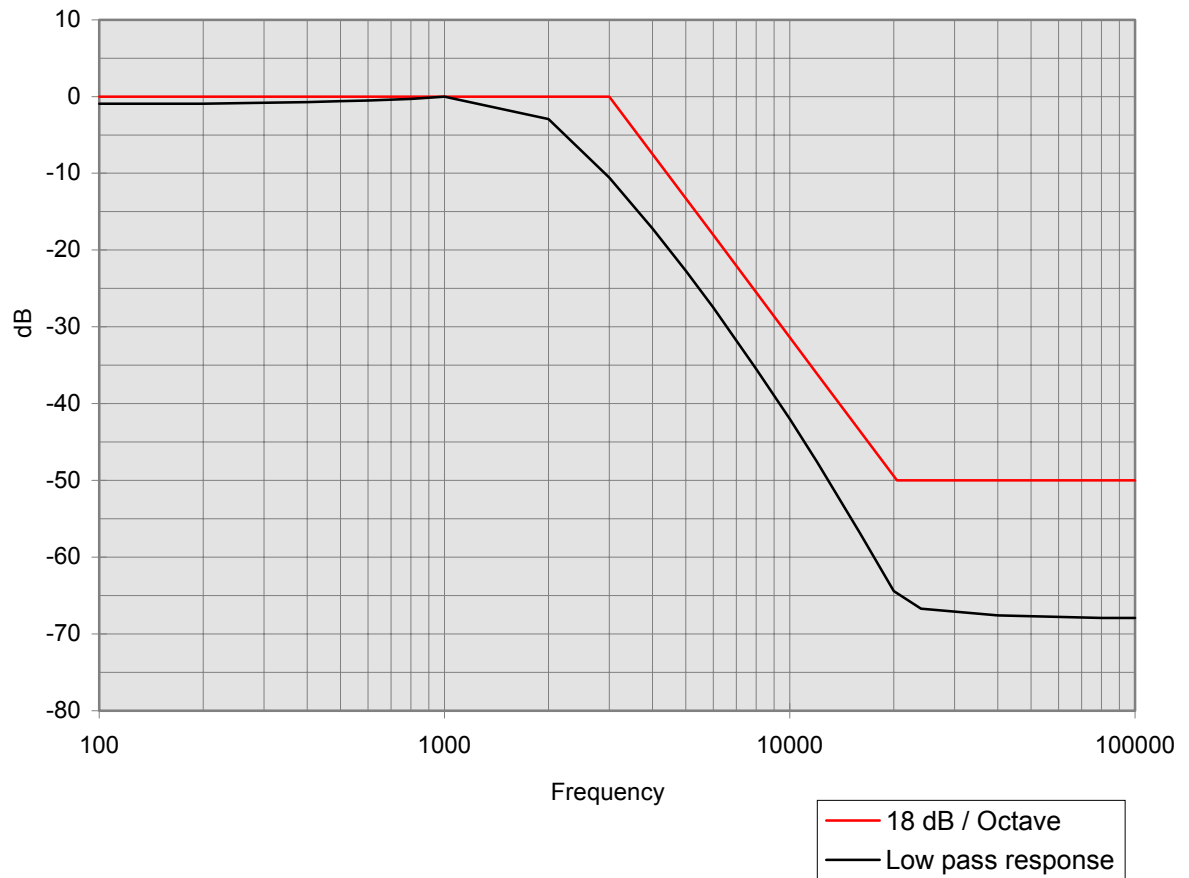
**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**CURVE:**



**TYPE OF TEST:** PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

**FCC PART:** 2.1047 (b)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**PROCEDURE:**

1. The SST-442 was aligned for transmitter operation on 465.0125 MHz (Fo) per the tune-up procedure outlined in the Preliminary Maintenance Manual.
2. The SST-442 was connected at antenna terminal P201 to the RF input of an IFR COM-120B Communications Test Set used to measure FM deviation.
3. The output of a BK Precision Model 4010 Function Generator was applied to the microphone input of the SST-442 through J301. The output of the audio generator was set to an output level of 0.5 VRMS, a level sufficient to drive the audio circuit into limiting at any frequency.
4. A Fluke Model 45 Dual Display Multimeter was used to measure the amplitude of the signal applied to the microphone input.
5. The frequency of the audio generator was adjusted to find the frequency of maximum response. The SST-442 was set for 12.5 kHz bandwidth operation and the deviation was adjusted for +/- 2.5 kHz as outlined in the Preliminary Maintenance Manual.
6. The frequency of the audio signal generator was set to 300 Hz and the output level was adjusted to produce 250 Hz deviation, which is 10% of the rated modulation. The voltage level was then adjusted for 20% of the rated modulation, and repeated for every 10% increment.
7. The input voltage was adjusted to a level 16 dB greater than required to produce 50% modulation. The maximum deviation was noted, along with the level required to achieve it, if 100% modulation was not realized.
8. Steps 6 and 7 were repeated for frequencies of 500, 750, 1000, 2000 and 3000 Hz.
9. The SST-442 was set for 25 kHz bandwidth operation and the deviation was adjusted for +/- 5 kHz as outlined in the Preliminary Maintenance Manual.
10. Steps 6, 7 and 8 were repeated for 25 kHz bandwidth operation.
11. Results were plotted on separate graphs for 12.5 kHz and 25 kHz bandwidth operation.

**TYPE OF TEST:** PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

**FCC PART:** 2.1047 (b)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**TEST RESULTS:**

Percent Modulation	Deviation (kHz)	Input level (mVRMS) - <b>12.5 kHz Bandwidth</b>					
		300 Hz	500 Hz	750 Hz	1000 Hz	2000 Hz	3000 Hz
10%	0.25	15.4	4.1	2.5	1.8	1.1	1.8
20%	0.50	33.6	8.8	5.0	3.6	2.4	3.8
30%	0.75	49.8	13.3	7.7	5.4	3.5	5.9
40%	1.00	67.8	17.9	10.4	7.4	4.8	8.9*
50%	1.25	85.3	22.5	13.1	9.2	6.1	
60%	1.50	101.4	27.7	15.8	11.2	7.3	
70%	1.75	118.9	32.3	18.3	13.1	8.7	
80%	2.00	137.8	47.3	22.8	15.2	11.5*	
90%	2.25	167.9*	63.1*	30.6	19.4		
100%	2.50			49.9*	46.4*		
Level at 50%	+16 dB	538.2	142.0	82.7	58.1	38.5	56.2
Max Deviation	(kHz)	2.15*	2.18*	2.31*	2.38*	1.94*	0.86*

Percent Modulation	Deviation (kHz)	Input level (mVRMS) - <b>25 kHz Bandwidth</b>					
		300 Hz	500 Hz	750 Hz	1000 Hz	2000 Hz	3000 Hz
10%	0.50	15.6	4.4	2.6	1.9	1.2	1.9
20%	1.00	32.4	9.0	5.2	3.8	2.5	3.9
30%	1.50	49.0	13.6	7.9	5.7	3.7	6.2
40%	2.00	65.7	18.5	10.6	7.6	5.0	15.5*
50%	2.50	82.5	23.1	13.3	9.6	6.2	
60%	3.00	100.1	27.7	16.1	11.6	7.7	
70%	3.50	116.2	33.6	18.9	13.6	9.5	
80%	4.00	134.3	48.6	23.5	15.7	13.9*	
90%	4.50	260.5*	88.0*	38.9*	20.7		
100%	5.00				38.7*		
Level at 50%	+ 16 dB	520.6	145.8	83.9	60.6	39.1	97.8
Max Deviation	(kHz)	4.20*	4.27*	4.50*	4.65*	3.73*	1.70*

Certifying Engineer:

*Michael A. Pickard*

Michael A. Pickard - Project Engineer

**TYPE OF TEST:** PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

**FCC PART:** 2.1047 (b)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

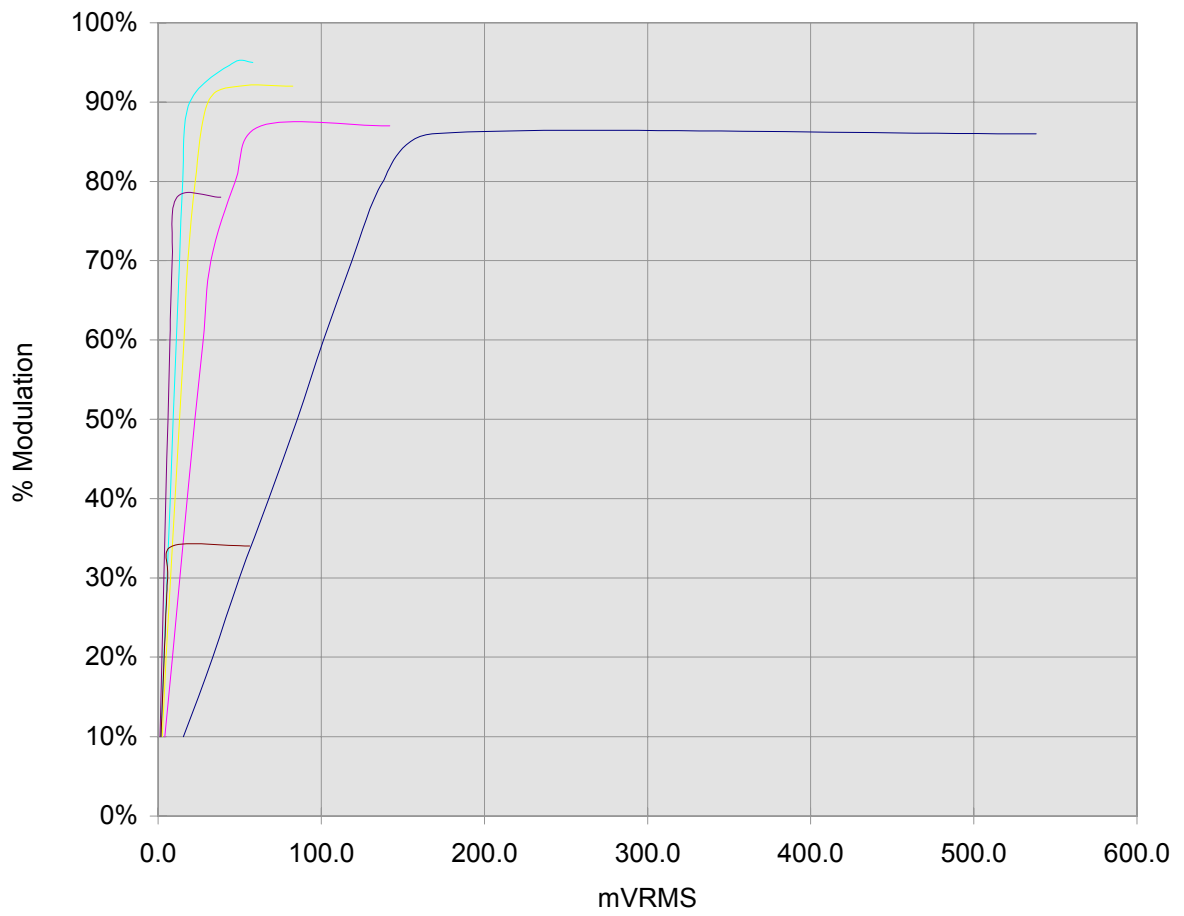
**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**CURVE:**



Channel Bandwidth: 12.5 KHz  
100% Modulation: 2.5 KHz

— 300 Hz — 500 Hz — 750 Hz  
— 1000 Hz — 2000 Hz — 3000 Hz

**TYPE OF TEST:** PERCENT MODULATION VS. MODULATION INPUT VOLTAGE

**FCC PART:** 2.1047 (b)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

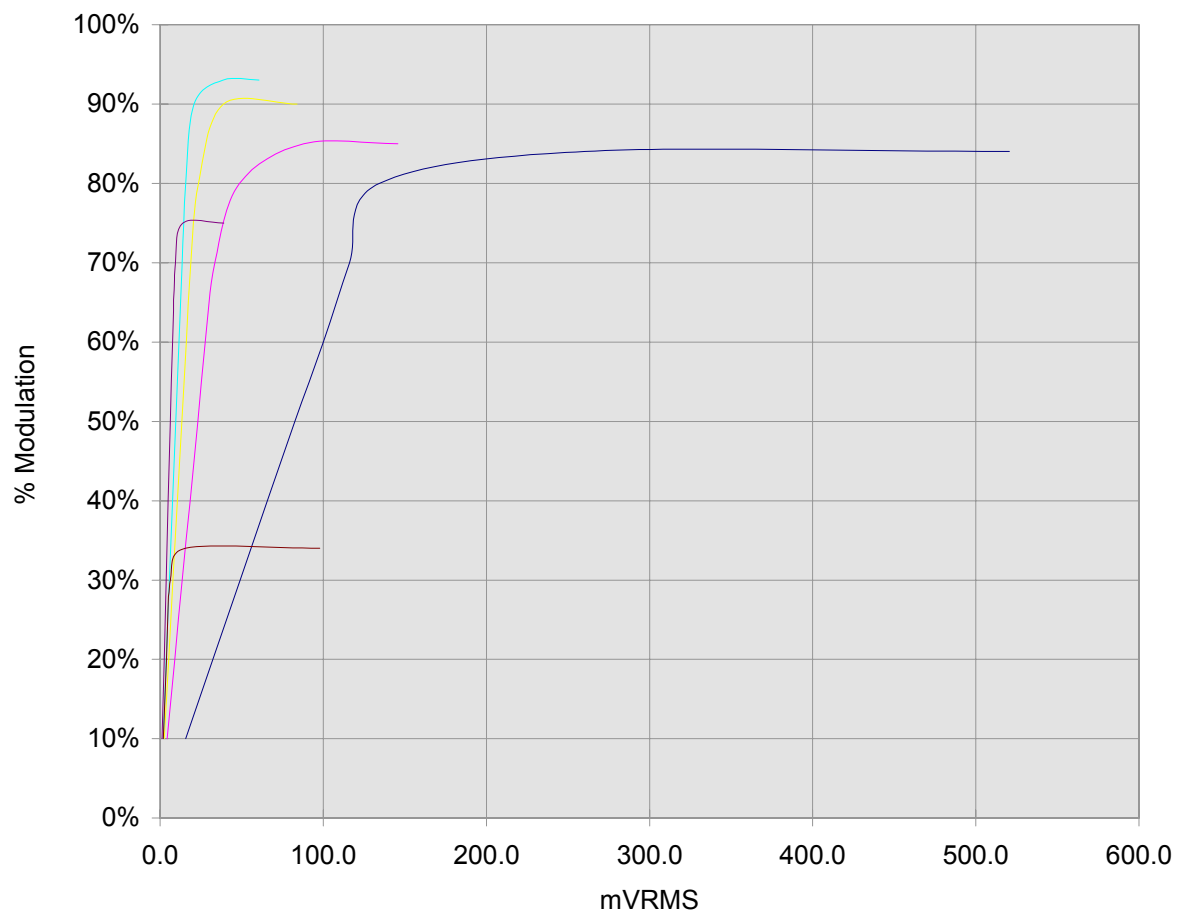
**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**CURVE:**



Channel Bandwidth: 25.0 KHz  
100% Modulation: 5.0 KHz

— 300 Hz — 500 Hz — 750 Hz  
— 1000 Hz — 2000 Hz — 3000 Hz

**TYPE OF TEST:** OCCUPIED BANDWIDTH

**FCC PART:** 2.1049 (c)(1) per 90.210 (b)(d)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**PROCEDURE:**

1. The SST-442 was aligned for transmitter operation on 465.0125 MHz (Fo) at full rated power, was set for 12.5 KHz bandwidth operation, and the deviation was adjusted for +/- 2.5 KHz as outlined in the Preliminary Maintenance Manual.
2. The RF output of the SST-442 was measured with a Bird Model 6154 Thermaline Wattmeter. This value was recorded as POWER OUTPUT. Power was supplied to the SST-442 via P302 by an Astron Model VS-20M Power Supply set at +8.4 VDC to produce the maximum rated transmitter power output.
3. The antenna terminal P201 was connected to the input of a Bird Model 8306-300-N 30 DB power attenuator. The output of the attenuator was connected to the input of a Hewlett Packard Model 8554B Spectrum Analyzer. The spectrum analyzer was set to:
  - 100 Hz Resolution
  - 5 KHz per Horizontal Division
  - 0 dBm Reference
  - 10 dB per Vertical Division
4. The center frequency of the spectrum analyzer was set to the SST-442 carrier frequency and the full scale reference line was set to the level of the unmodulated carrier.
5. The output of a BK Precision Model 4010 Function Generator was applied to the microphone input of the SST-442 through J301. The frequency of the audio signal generator was set to 2500 Hz and the output adjusted to a level 16 dB greater than that necessary to produce 50% of the rated system deviation at the frequency of maximum response.
6. The spectrum analyzer readings of the sideband levels in dBm were recorded and a graph of the spectrum analyzer output was plotted. All readings were rounded up to the nearest dB.
7. The SST-442 was set for 25 KHz bandwidth operation, and the deviation was adjusted for +/- 5 KHz as outlined in the Preliminary Maintenance Manual. Steps 3 - 6 were repeated for 25 KHz bandwidth operation.



**TYPE OF TEST:** OCCUPIED BANDWIDTH  
**FCC PART:** 2.1049 (c)(1) per 90.210 (b)(d)  
**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032  
**MODEL:** SST-442  
**TYPE OF UNIT:** UHF-FM Handheld Transceiver  
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**EQUATIONS:**

The analyzer readings in dBm were converted to power using the following formula:

$$\text{Power} = .001 (\text{antilog } F(\text{dBm}, 10) )$$

The power readings were summed to provide a reference power level. The total was converted back to dBm with the following formula and recorded as MEAN REFERENCE POWER OUTPUT:

$$\text{dBm} = 10 (\log Fc (\text{Power}, .001))$$

The sideband powers on each side of the carrier were reduced to a percentage of the MEAN REFERENCE POWER OUTPUT. The percentages were added together starting with the carrier and expanding out equally in +/- 2.5 KHz increments until greater than 99.5% of the total MEAN REFERENCE POWER was reached.

The occupied bandwidth is defined as having 99.5% of the total MEAN REFERENCE POWER existing within its limits.

Certifying Engineer:

  
Michael A. Pickard - Project Engineer

**TYPE OF TEST:** OCCUPIED BANDWIDTH

**FCC PART:** 2.1049 (c)(1) per 90.210 (b)(d)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**DATA:** Carrier Frequency: 465.0125 MHz  
Power Output: 2.40 Watts  
Power Output: 33.80 dBm  
Mean Reference Power: 32.11 dBm  
Channel Bandwidth: 12.5 kHz  
Occupied Bandwidth: 10.0 kHz

Emission Frequency Offset (kHz)	Measured Relative Amplitude (dBm)	Actual Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0			-20.00			
-22.5			-20.00			
-20.0			-20.00			
-17.5			-20.00			
-15.0	-71.00	-37.20	-20.00	190.6E-9	0.00%	
-12.5	-70.00	-36.20	-36.14	240.0E-9	0.00%	
-10.0	-66.00	-32.20	-17.96	602.9E-9	0.00%	
-7.5	-52.00	-18.20	0.21	15.1E-6	0.00%	
-5.0	-34.00	-0.20	33.80	955.5E-6	0.06%	
-2.5	-16.00	17.80	33.80	60.3E-3	3.71%	
0.0	-2.00	31.80	33.80	1.5E+0	93.22%	100.00%
2.5	-17.00	16.80	33.80	47.9E-3	2.95%	
5.0	-34.00	-0.20	33.80	955.5E-6	0.06%	
7.5	-53.00	-19.20	0.21	12.0E-6	0.00%	
10.0	-66.00	-32.20	-17.96	602.9E-9	0.00%	
12.5	-70.00	-36.20	-36.14	240.0E-9	0.00%	
15.0	-73.00	-39.20	-20.00	120.3E-9	0.00%	
17.5			-20.00			
20.0			-20.00			
22.5			-20.00			
25.0			-20.00			

Certifying Engineer:

*Michael A. Pickard*  
Michael A. Pickard - Project Engineer

**TYPE OF TEST:** OCCUPIED BANDWIDTH

**FCC PART:** 2.1049 (c)(1) per 90.210 (b)(d)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

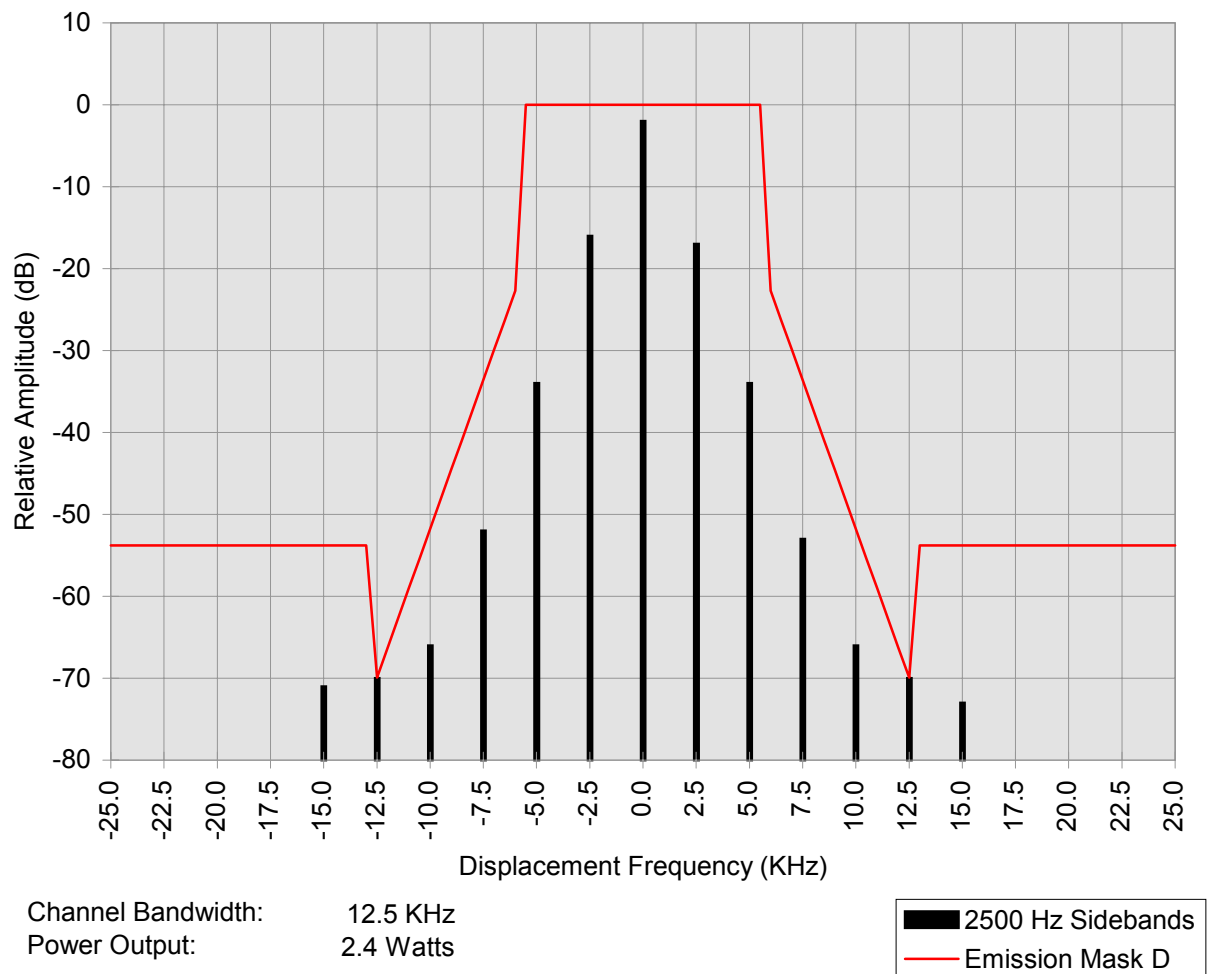
**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**CURVE:**



**TYPE OF TEST:** OCCUPIED BANDWIDTH

**FCC PART:** 2.1049 (c)(1) per 90.210 (b)(d)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
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**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

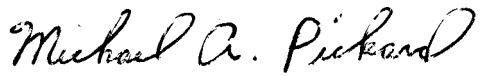
**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**DATA:** Carrier Frequency: 465.0125 MHz  
Power Output: 2.40 Watts  
Power Output: 33.80 dBm  
Mean Reference Power: 33.66 dBm  
Channel Bandwidth: 25.0 KHz  
Occupied Bandwidth: 20.0 KHz

Emission Frequency Offset (KHz)	Measured Relative Amplitude (dBm)	Actual Amplitude (dBm)	FCC Limit (dBm)	Power (Watts)	Percent MRP (%)	Occupied Bandwidth (%)
-25.0			-1.20			
-22.5			-1.20			
-20.0			8.80			
-17.5	-73.00	-39.20	8.80	120.3E-9	0.00%	
-15.0	-71.00	-37.20	8.80	190.6E-9	0.00%	
-12.5	-65.00	-31.20	8.80	758.9E-9	0.00%	
-10.0	-50.00	-16.20	33.80	24.0E-6	0.00%	
-7.5	-35.00	-1.20	33.80	758.9E-6	0.03%	
-5.0	-20.00	13.80	33.80	24.0E-3	1.03%	
-2.5	-8.00	25.80	33.80	380.4E-3	16.36%	
0.0	-2.00	31.80	33.80	1.5E+0	65.15%	100.00%
2.5	-8.00	25.80	33.80	380.4E-3	16.36%	
5.0	-20.00	13.80	33.80	24.0E-3	1.03%	
7.5	-36.00	-2.20	33.80	602.9E-6	0.03%	
10.0	-54.00	-20.20	33.80	9.6E-6	0.00%	
12.5	-65.00	-31.20	8.80	758.9E-9	0.00%	
15.0	-70.00	-36.20	8.80	240.0E-9	0.00%	
17.5	-72.00	-38.20	8.80	151.4E-9	0.00%	
20.0			8.80			
22.5			-1.20			
25.0			-1.20			

Certifying Engineer:

  
Michael A. Pickard - Project Engineer

**TYPE OF TEST:** OCCUPIED BANDWIDTH

**FCC PART:** 2.1049 (c)(1) per 90.210 (b)(d)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

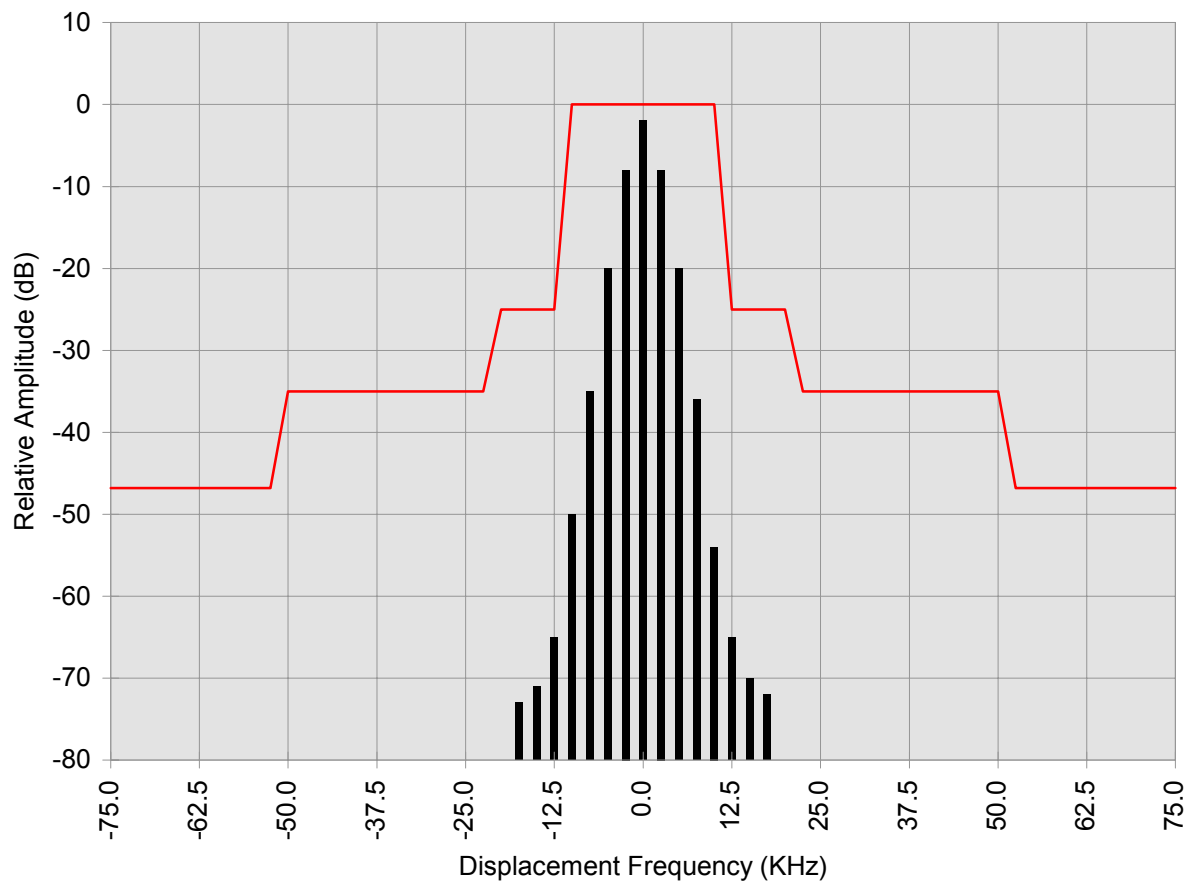
**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**CURVE:**



Channel Bandwidth: 25 KHz  
Power Output: 2.4 Watts

2500 Hz Sidebands  
Emission Mask B

**TYPE OF TEST:** SPURIOUS EMISSIONS AT ANTENNA TERMINALS

**FCC PART:** 2.1051

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**PROCEDURE:**

1. The SST-442 was aligned for transmitter operation on 465.0125 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.
2. Power was supplied to the SST-442 by a BK Precision Model 1630 Power Supply. The supply voltage was set to +8.4 VDC to represent the highest possible operating voltage.
3. The transmitter was modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation as specified in FCC Part 2.1049 (c)(1).
4. The SST-442 antenna terminal P201 was connected to the input of a Bird Model 8306-300-N, 30 dB power attenuator, in series with a notch filter tuned to the carrier frequency. The output of the notch filter and attenuator was connected to the input of a Hewlett-Packard Model 8559A Spectrum Analyzer.
5. The spectrum was searched from 8 MHz to the 10th harmonic of the operating frequency. All unreported emissions were more than 30 dB below the FCC limit of  $50 + 10 \log P$ , or -20 dBm.
6. The measured insertion loss of the attenuators, notch filter, and cables are listed as the "Correction Factor" on the data sheet.

**TYPE OF TEST:** SPURIOUS EMISSIONS AT ANTENNA TERMINALS

**FCC PART:** 2.1051

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**TEST RESULTS:**

Carrier Frequency (Fo): 465.0125 MHz  
Oscillator Frequency: 3.6 MHz  
Output Power: 2.4 Watts  
Supply Voltage: 8.4 VDC  
FCC Limit: -20 dBm

Emmission Frequency (MHz)	Multiple of Carrier	Measured Amplitude (dBm)	Correction Factor (dB)	Resultant Amplitude (dBm)
465.0125	fo	-27	61	34
468.6125	fo + (3.6)	-80	39	-41
469.2250	fo + (3.6 + .6125)	-80	39	-41
930.0250	fo * 2	-54	34	-20
1395.0375	fo * 3	-81	31	-50
1860.0500	fo * 4	-74	31	-43
2325.0625	fo * 5	-78	31	-47

Certifying Engineer:

  
Michael A. Pickard - Project Engineer

**TYPE OF EXHIBIT:** FIELD STRENGTH OF SPURIOUS RADIATION

**FCC PART:** 2.0153

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Transceiver

**FCC ID:** AIERIT13-442

**DATE:** May 11, 2001

**PROCEDURE:**

- 1, The measurement for effective radiated power was taken at the RITRON, Inc. 3 meter test site. The measurement was made in accordance with FCC Rules & Regulations Part 2.947 using the procedures of IEC Publication 106.
2. The SST-442 was aligned for transmitter operation on 465.0125 MHz at the 2.2 Watt maximum obtainable from the unit per the tune-up procedure outlined in the Preliminary Maintenance Manual. The unit was then terminated at the antenna port with the two antennas sold with this product.
3. All field strength measurements were made with the Hewlett-Packard Model 8559A Spectrum Analyzer and the appropriate antenna for the frequency being measured. The antennas used were:
  - Electro-Metrics BDA-25 Dipole Antenna at 0 to 200 MHz
  - Electro-Metrics LP-25 Log Periodic Antenna at 200 to 1000 MHz
  - Polarad CA-BB Microwave Antenna at 1000 to 10,000 MHz
4. The height and polarization of the field strength measurement antenna and orientation of the SST-442 were varied to provide maximum field strength of each spurious signal.
5. The spectrum was searched from 4 MHz to the 10th harmonic of the transmit frequency. All unreported emissions were more than 20 dB below the FCC limits specified in Part 90.210(d)(3).
6. A substitution antenna, an Electro-Metrics EM-6924 adjustable dipole, was substituted for the SST-442 at the SST-442's location. A RF signal generator was set for the frequency of the SST-442's spurious signal with the level at the substitution antenna noted.
7. The polarization of the substitution antenna was adjusted for maximum signal strength at the field strength measuring antenna. The level at the field strength antenna was noted.



**TYPE OF EXHIBIT:** FIELD STRENGTH OF SPURIOUS RADIATION

**FCC PART:** 2.0153

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Transceiver

**FCC ID:** AIERIT13-442

**DATE:** May 11, 2001

**EQUATIONS:**

The substitution antenna is specified from the manufacturer in terms of antenna factor rather than antenna gain. The conversion is:

$$Ga(dbd) = 20 \log f \text{ (MHz)} - AF(dB) - 31.9$$

The effective radiated power (ERP) is then:

$$ERP(dBm) = Pr(dBm) + Pgen(dBm) - Ps(dBm) - Ga(dBd)$$

Where:

Pr is the power level of the radio's emission at the receiving antenna output.

Pgen is the RF signal generator level at the substitution antenna output.

Ps is the power level of the substitution antenna emission at the receiving antenna output.

Ga is the gain of the substitution antenna.

The ERP is converted to watts from dBm by:

$$ERP(watts) = \text{antilog}_{10}((ERP(dBm) - 30)/10)$$

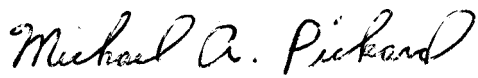
**TYPE OF EXHIBIT:** FIELD STRENGTH OF SPURIOUS RADIATION  
**FCC PART:** 2.1053  
**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032  
**MODEL:** SST-442  
**TYPE OF UNIT:** UHF-FM Transceiver  
**FCC ID:** AIERIT13-442  
**DATE:** May 11, 2001

**RESULTS:**

Frequency (MHz)	Pr (dBm)	Pgen (dBm)	Ps (dBm)	Ga (dBd)	Spurious Emission (dBm)	FCC Limit (dBm)
930.0125	-63.0	0.0	-42.0	-0.2	-20.8	-20.0

All other spurious emissions were at least 20 dB below the limit.

Certifying Engineer:



Michael A. Pickard - Project Engineer

**TYPE OF TEST:** FREQUENCY STABILITY VS. TEMPERATURE

**FCC PART:** 2.1055 (a)(1)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** April 2, 2001

**PROCEDURE:**

1. The SST-442 was aligned for transmitter operation on 465.0125 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.
2. Power was supplied to the SST-442 by a BK Precision Model 1630 power supply set to the nominal operating voltage of +7.2 VDC. The SST-442 antenna terminal P201 was connected to the input of an IFR COM-120B RF communications test set, used to measure frequency of the carrier.
3. Temperature was measured with an Omega Model 7035-J-225 thermocouple connected directly to the case of Y302, a TCVCXO reference oscillator mounted on the SST-442 printed circuit board.
4. The SST-442 was enclosed in a plastic bag and placed into an Associated Laboratories Model ELH-0.5-LC environmental test chamber.
5. The temperature was raised to +50°C and allowed to stabilize for 30 minutes. The transmitter was activated and the frequency output recorded. The temperature was lowered in 10°C increments down to -30°C, allowing 30 minutes to stabilize at each temperature.
6. All measurements were converted to part-per-million (ppm) deviation and charted on a linear graph.

**TYPE OF TEST:** FREQUENCY STABILITY VS. TEMPERATURE

**FCC PART:** 2.1055 (a)(1)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442


**DATE:** April 2, 2001

**TEST RESULTS:**

Frequency: 465.0125 MHz  
Nominal Temp: +20 °C  
FCC Limit: +/- 2.5 ppm

Temperature (°C)	Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
50	465.012310	-190	-0.41
40	465.012320	-180	-0.39
30	465.012420	-80	-0.17
20	465.012610	110	0.24
10	465.012750	250	0.54
0	465.012860	360	0.77
-10	465.012680	180	0.39
-20	465.012850	350	0.75
-30	465.012320	-180	-0.39

Certifying Engineer:

  
Michael A. Pickard - Project Engineer

**TYPE OF TEST:** FREQUENCY STABILITY VS. TEMPERATURE

**FCC PART:** 2.1055 (a)(1)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

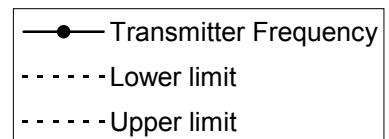
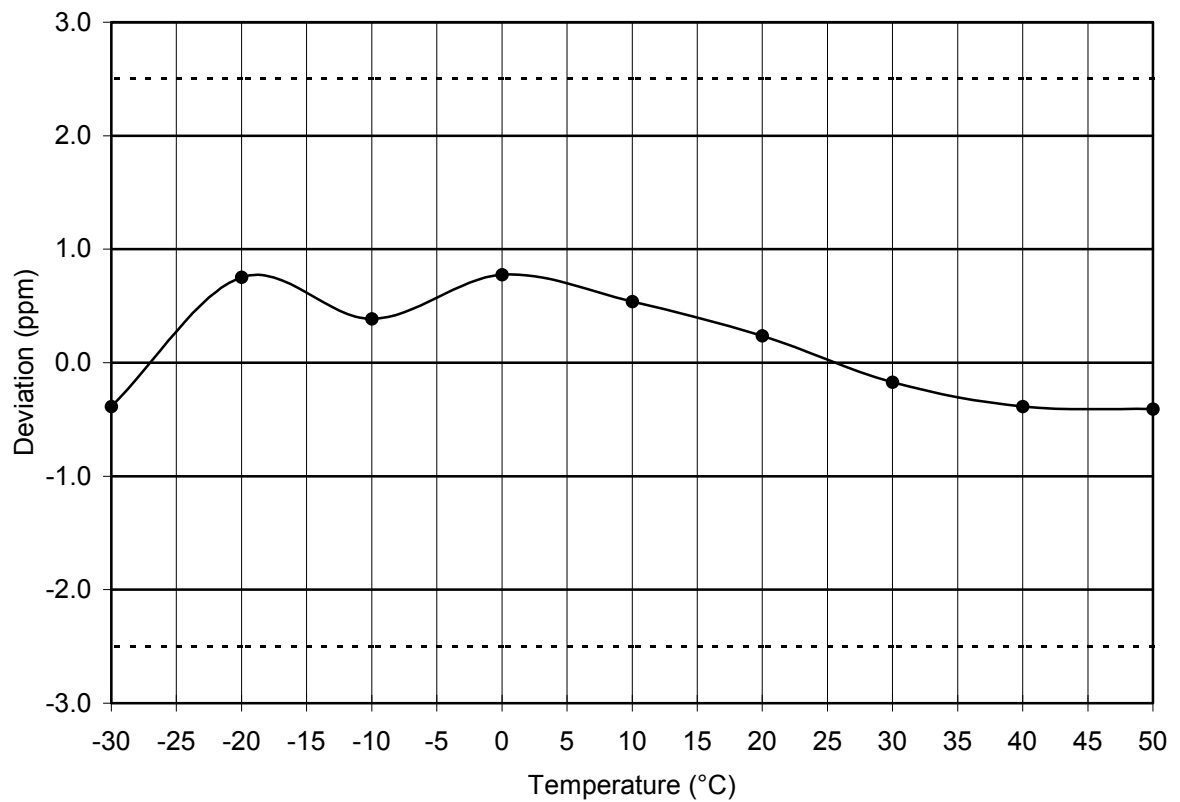
**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** April 2, 2001

**CURVE:**



**TYPE OF TEST:** FREQUENCY STABILITY VS. BATTERY VOLTAGE

**FCC PART:** 2.1055 (d)(2)

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** March 30, 2001

**PROCEDURE:**

1. The SST-442 was aligned for transmitter operation on 465.0125 MHz (Fo) at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual.
2. Power was supplied to the SST-442 by a BK Precision Model 1630 power supply, and supply voltage was measured at P302 battery connector with a Micronta Model 22-191 Digital Multimeter.
3. The SST-442 antenna terminal P201 was connected to the input of an IFR COM-120B RF communications test set, used to measure frequency of the carrier.
4. Frequency measurements were made at +25°C with supply voltage set to 6.0, 7.2 and 8.4 VDC.
5. The lowest operating voltage is determined by battery end of life voltage for each cell multiplied by the number of individual cells. The maximum cell voltage multiplied by the number of cells determines the highest operating voltage. For AA NiCd and NiMH cells the lowest operating voltage is 1 VDC and the highest operating voltage is 1.4 VDC.

Lowest operating voltage	1.0 VDC X 6 cells	6.0 VDC
Nominal operating voltage	1.2 VDC X 6 cells	7.2 VDC
Lowest operating voltage	1.4 VDC X 6 cells	8.4 VDC

6. All frequencies were referenced to the measurement made at +7.2 VDC, the nominal supply voltage for a 6-cell AA NiCd battery pack.


**TYPE OF TEST:** FREQUENCY STABILITY VS. BATTERY VOLTAGE  
**FCC PART:** 2.1055 (d)(2)  
**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032  
**MODEL:** SST-442  
**TYPE OF UNIT:** UHF-FM Handheld Transceiver  
**FCC ID:** AIERIT13-442  
**DATE:** March 30, 2001

**TEST RESULTS:**

Carrier Frequency: 465.0125 MHz

Battery Voltage (VDC)	Battery Condition	Transmitter Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
6.0	end of life	465.012480	-20	-0.04
7.2	nominal	465.012500	0	0.00
8.4	high charge	465.012500	0	0.00

Certifying Engineer:



Michael A. Pickard - Project Engineer

**TYPE OF TEST:** TRANSIENT FREQUENCY BEHAVIOR

**FCC PART:** 90.214

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

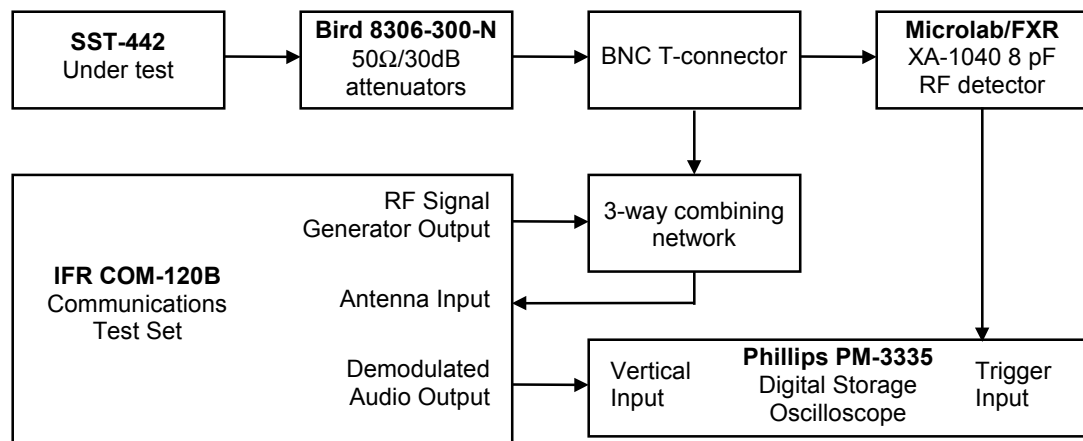
**FCC ID:** AIERIT13-442

**DATE:** April 10, 2001

**PROCEDURE:**

The SST-442 was aligned for transmitter operation on 465.0125 at full rated power per the tune-up procedure outlined in the Preliminary Maintenance Manual. The tests were conducted per EIA-603 Part 2.2.19 as follows:

1. The test equipment was connected per the following diagram:

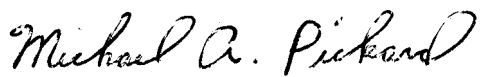


2. The IFR COM-120B receiver was set to measure FM deviation with the audio bandwidth set at  $\leq 20$  Hz to 15 KHz and the RF frequency set to 465.0125 MHz.
3. The SST-442 transmitter under test was turned on and the IFR COM-120B Spectrum Analyzer was used to measure the RF power level through the test network.
4. The SST-442 transmitter was turned off.
5. The IFR COM-120B RF signal generator was set to 465.0125 MHz at an RF level 20 dB below that measured in step 3, modulated with a 1 KHz tone at  $\pm 25$  KHz deviation.
6. The Phillips PM-3335 digital oscilloscope's horizontal sweep rate was set to 10 mS per division. The vertical amplitude control was adjusted to display the 1000 Hz demodulated audio from the signal generator at  $\pm 4$  divisions, vertically centered on the screen.



7. The Phillips PM-3335 digital oscilloscope was set to trigger at 1 division from the left side of the display when the RF detector senses RF power from the SST-442 transmitter.
8. The attenuation of the RF attenuator was reduced so the input of the RF detector and the RF combiner is increased by 30 dB when the SST-442 transmitter is turned on.
9. The SST-442 transmitter is turned on and the resulting waveform on the oscilloscope display was stored and plotted. The FCC limits per Part 90.214 were added to the plot in the same manner illustrated in EIA-603 Part 3.2.19.2. The resulting plot is labeled "switch on condition" and shows compliance with FCC Part 90.214.
10. The Phillips PM-3335 digital oscilloscope was set to trigger at 1 division from the right side of the display when the RF detector senses loss of RF power from the SST-442 transmitter.
11. The SST-442 transmitter is turned off and the resulting waveform on the oscilloscope display was stored and plotted. The FCC limits per Part 90.214 were added to the plot in the same manner illustrated in EIA-603 Part 3.2.19.2. The resulting plot is labeled "switch off condition" and shows compliance with FCC Part 90.214.

Certifying Engineer:



Michael A. Pickard - Project Engineer

**TYPE OF TEST:** TRANSIENT FREQUENCY BEHAVIOR

**FCC PART:** 90.214

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

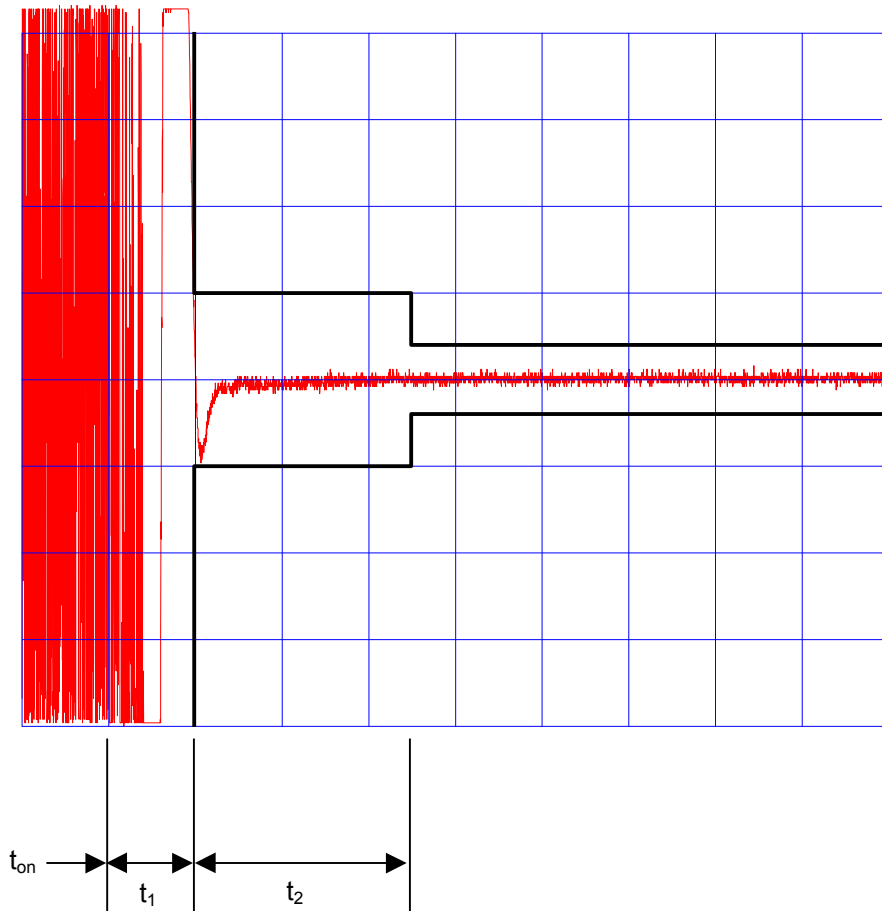
**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** April 10, 2001

**SWITCH ON CONDITION  $t_{on}$ ,  $t_1$ , and  $t_2$**



**TYPE OF TEST:** TRANSIENT FREQUENCY BEHAVIOR

**FCC PART:** 90.214

**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032

**MODEL:** SST-442

**TYPE OF UNIT:** UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** April 10, 2001

**SWITCH ON CONDITION  $t_3$  and  $t_{OFF}$**

