

RADIATED EMISSIONS DATA USING FCC PART 15 SUBPART C LIMITS AT 3 METER AND 1 METER EUT TO ANTENNA DISTANCES.

FILE NAME: NAT0102

EUT NAME: MINIATURE WIRELESS TV TRANSMITTERS.

THE EUTs ARE POWERED BY 9vdc BATTERIES (1 battery/camera).
THERE WILL BE TEN UNITS MEASURED. THEY ARE LABELED 1 TO 10.
CUSTOMER REPRESENTATIVE: JIM USSAILIS

TESTED BY: STEVE PETIX ON 8/28/01 TO FCC PART 15 FOR INTENTIONALLY AND UNINTENTIONALLY RADIATING DEVICES USING THE 3 METER OPEN AREA TEST SITE FOR 30 TO 1000 MHz AND A 1 METER DISTANCE IN FRONT OF THE SPECTRUM ANALYZER.

A SCHWARZBECK MODEL VHA9103 BICONICAL ANTENNA, (s/n: A) IS USED FOR 30 TO 200 MHz.

AN AILTECH MODEL 96005, (s/n 1095), LOG PERIODIC ANTENNA IS USED FOR 200 TO 1000 MHz.

AN ELECTROMECHANICS MODEL 3115, s/n 2498 DOUBLE RIDGE WAVEGUIDE ANTENNA IS USED FOR 1000 TO 18,000 MHz.

ALL MEASUREMENTS BELOW 1000 MHz USE QUASI-PEAK DETECTION.
FOR ABOVE 1000 MHz, PEAK AND AVERAGE DETECTION ARE USED.

SINCE ALL TRANSMITTING FREQUENCIES USED BY THESE TV TRANSMITTERS ARE BETWEEN 906 AND 920 MHz, FCC PART 15, SUBPART C, SECTION 15.249 ALLOWS THE TRANSMITTER FUNDAMENTAL FREQUENCIES A LIMIT OF 93.98 dBuV/m. HARMONICS MUST BE BELOW 53.98 dBuV/m. THE ALLOWED BANDWIDTH IS +/- 0.5% OF THE TRANSMIT FREQUENCY, APPROXIMATELY 4 MHz.

A 10MHz-wide spectrum analyzer trace was taken of the fundamental frequency for all ten TV transmitters. The traces demonstrates the bandwidth compliance. All measurements were performed while the EUT was completely operational and transmitting an image to a remote monitor fifteen meters distant.

The ten EUT samples represent potential configurations of black & white, color, and stand-alone (no camera) transmitting sections at different fundamental transmitting frequencies. Where used, the color-phasing signals are treated as fundamental signals.

The TV transmitter antennas are orientated vertically. The transmitters are fixed into a slot cut in a foam block with the device's center 1.5 meters above the ground plane. The measurement antenna is vertical and adjusted to the optimum height for maximum coupling. Measurements with the transmit antenna vertical and the receive antenna horizontal were not performed because the EUTs have negligible dimensions compared to the 1/4 wave whip antenna and power lead. The antenna and power lead with 9VDC battery attached were stretched in a linear fashion as seen in the photographs.

To better control fundamental and spurious emissions, the output capacitor, C10 was changed from 5.0 pfd to 5.6 pfd. This reduced the fundamental and harmonic signal strengths approximately 2 to 3 decibels.

Continued on the following page.

For all TV transmitters:

THE 30 TO 300 MHz ANTENNA IS VERTICAL AND AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

FUNDAMENTAL FREQUENCY MEASUREMENTS:

TV transmitter # 1 (Fundamental frequency of 916.5 MHz, Black & White camera)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL AND AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P (dBμV)	CABLE LOSS	ANTENNA FACTORS	TOTAL FIELD dBμV/m	LIMIT QUASI-P (dBμV)	PASS?	MARGIN (dBμV)
916.40	50	11.31	29.89	91.20	93.98	YES	2.8
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 2 (Fundamental frequency of 920 MHz, Black & White camera)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL AND AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
920.00	52	11.31	29.57	92.88	93.98	YES	1.1
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 3 (Fundamental frequency of 916.5 MHz, Black & White camera.)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL AND AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P (dBμV)	CABLE LOSS	ANTENNA FACTORS	TOTAL FIELD dBμV/m	LIMIT QUASI-P (dBμV)	PASS?	MARGIN (dBμV)
916.45	52	11.31	29.89	93.20	93.98	YES	0.8
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

Continued on the following page.

FUNDAMENTAL FREQUENCY MEASUREMENTS:

Using TV transmitter # 4 (Fundamental frequency of 906 MHz, Black & White Camera)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL AND AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
905.89	51	11.31	30.78	93.09	93.98	YES	0.9
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

Using TV transmitter # 5 (Fundamental frequency of 920 MHz, color camera.)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL AND AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
916.39	24	11.31	29.89	65.20	93.98	YES	28.8
919.87	47	11.31	29.65	87.96	93.98	YES	6.0
923.50	20	11.31	29.33	60.64	93.98	YES	33.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 6 (Fundamental frequency of 916.5 MHz, color camera.)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL & AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
912.43	24	11.31	30.22	65.53	93.98	YES	28.5
916.62	50	11.31	29.89	91.20	93.98	YES	2.8
920.23	25	11.31	29.57	65.88	93.98	YES	28.1
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

Using TV transmitter # 7 (Fundamental frequency of 906 MHz, color camera.)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL & AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
901.49	27	11.31	31.10	69.42	93.98	YES	24.6
905.86	51	11.31	30.78	93.09	93.98	YES	0.9
910.30	25	11.31	30.38	66.69	93.98	YES	27.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

Using TV transmitter # 8 (Fundamental frequency of 920 MHz with no camera system.)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL & AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
919.83	51	11.31	29.65	91.96	93.98	YES	2.0
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

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TV transmitter # 9 (Fundamental frequency of 916.5 MHz with no camera system.)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL & AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
916.44	50	11.31	29.89	91.20	93.98	YES	2.8
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 10 (Fundamental frequency of 906 MHz with no camera system.)

THE 300 TO 1000 MHz ANTENNA IS VERTICAL & AT 3 METERS.							
FREQ. (MHz)	AMPL QUASI-P dB(μV)	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
905.88	51	11.31	30.78	93.09	93.98	YES	0.9
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

HIGH FREQUENCY HARMONICS MEASUREMENTS:

For the following measurements, the EUTs are moved into the laboratory and a 2 meter length of solid shield SMA cable is used to connect the guided double ridge antenna to the spectrum analyzer. The losses for this cable are negligible. A one meter antenna to EUT separation is used.

The measurements use AVERAGE and PEAK detection on the spectrum analyzer. The PEAK limits are 20dB above the AVERAGE limits. A 3 MHz resolution bandwidth is used. Because the measurements were made at 1 meter, the AVERAGE limits of 15.249(a) are increased by 10 dB.

TV transmitter # 1 (Fundamental frequency of 916.5 MHz)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK dBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
1833.00	-68	39.00	26.00	65.00	84	YES	19.0
2750.40	-68	39.00	29.70	68.70	84	YES	15.3
3669.00	-66	41.00	32.50	73.50	84	YES	10.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

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HIGH FREQUENCY HARMONICS MEASUREMENTS:

TV transmitter # 1 (Fundamental frequency of 916.5 MHz)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
1833.00	-79	28.00	26.00	54.00	64	YES	10.0
2750.40	-78	29.00	29.70	58.70	64	YES	5.3
3669.00	-78	29.00	32.50	61.50	64	YES	2.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 2 (Fundamental frequency of 920 MHz)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK dBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
2760.10	-68	39.00	29.70	68.70	84	YES	15.3
3682.40	-66	41.00	32.50	73.50	84	YES	10.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 2 (Fundamental frequency of 920 MHz)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
2760.10	-78	29.00	29.70	58.70	64	YES	5.3
3682.40	-77	30.00	32.50	62.50	64	YES	1.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 3 (Fundamental frequency of 916.5 MHz)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK DBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
1833.00	-68	39.00	26.00	65.00	84	YES	19.0
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

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TV transmitter # 3 (Fundamental frequency of 916.5 MHz)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
1833.00	-78	29.00	26.00	55.00	64	YES	9.0
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 4 (Fundamental frequency of 906 MHz)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK DBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
1816.00	-71	36.00	26.00	62.00	84	YES	22.0
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 4 (Fundamental frequency of 906 MHz)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
1816.00	-78	29.00	26.00	55.00	64	YES	9.0
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 5 (Fundamental frequency of 920 MHz. This is a color camera.)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK DBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
2760.70	-68	39.00	29.70	68.70	84	YES	15.3
3683.00	-67	40.00	32.50	72.50	84	YES	11.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 5 (Fundamental frequency of 920 MHz. This is a color camera.)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
2760.70	-77	30.00	29.70	59.70	64	YES	4.3
3683.00	-77	30.00	32.50	62.50	64	YES	1.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

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TV transmitter # 6 (Fundamental frequency of 916.5 MHz. This is a color camera.)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK DBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
2750.00	-66	41.00	29.70	70.70	84	YES	13.3
3669.40	-66	41.00	32.50	73.50	84	YES	10.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 6 (Fundamental frequency of 916.5 MHz. This is a color camera.)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
2750.40	-75	32.00	29.70	61.70	64	YES	2.3
3669.40	-77	30.00	32.50	62.50	64	YES	1.5
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 7 (Fundamental frequency of 906 MHz. This is a color camera.)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK DBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
1815.00	-71	36.00	26.00	62.00	84	YES	22.0
2718.70	-68	39.00	29.70	68.70	84	YES	15.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 7 (Fundamental frequency of 906 MHz. This is a color camera.)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
1815.00	-81	26.00	26.00	52.00	64	YES	12.0
2718.70	-79	28.00	29.70	57.70	64	YES	6.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 8 (Fundamental frequency of 920 MHz. This does not have a camera.)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK DBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
2760.00	-68	39.00	29.70	68.70	84	YES	15.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

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TV transmitter # 8 (Fundamental frequency of 920 MHz. This does not have a camera.)

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
2760.00	-76	31.00	29.70	60.70	64	YES	3.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 9 (Fundamental frequency of 916.5 MHz.)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK DBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 9 (Fundamental frequency of 916.5 MHz..)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 10 (Fundamental frequency of 906 MHz.)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL PEAK dBm	AMPL PEAK dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT PEAK dB(μV/m)	PASS?	MARGIN dB
2718.30	-68	39.00	29.70	68.70	84	YES	15.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

TV transmitter # 10 (Fundamental frequency of 906 MHz.)

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.							
FREQ. (MHz)	AMPL AVER dBm	AMPL AVER dB(μV)	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT AVER dB(μV/m)	PASS?	MARGIN dB
2718.30	-78	29.00	29.70	58.70	64	YES	5.3
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.							

THE NATIONAL WIRELESS TV TRANSMITTER MODULES MEET THE RADIATED EMISSIONS REQUIREMENT OF FCC PART 15, SUBPART C.