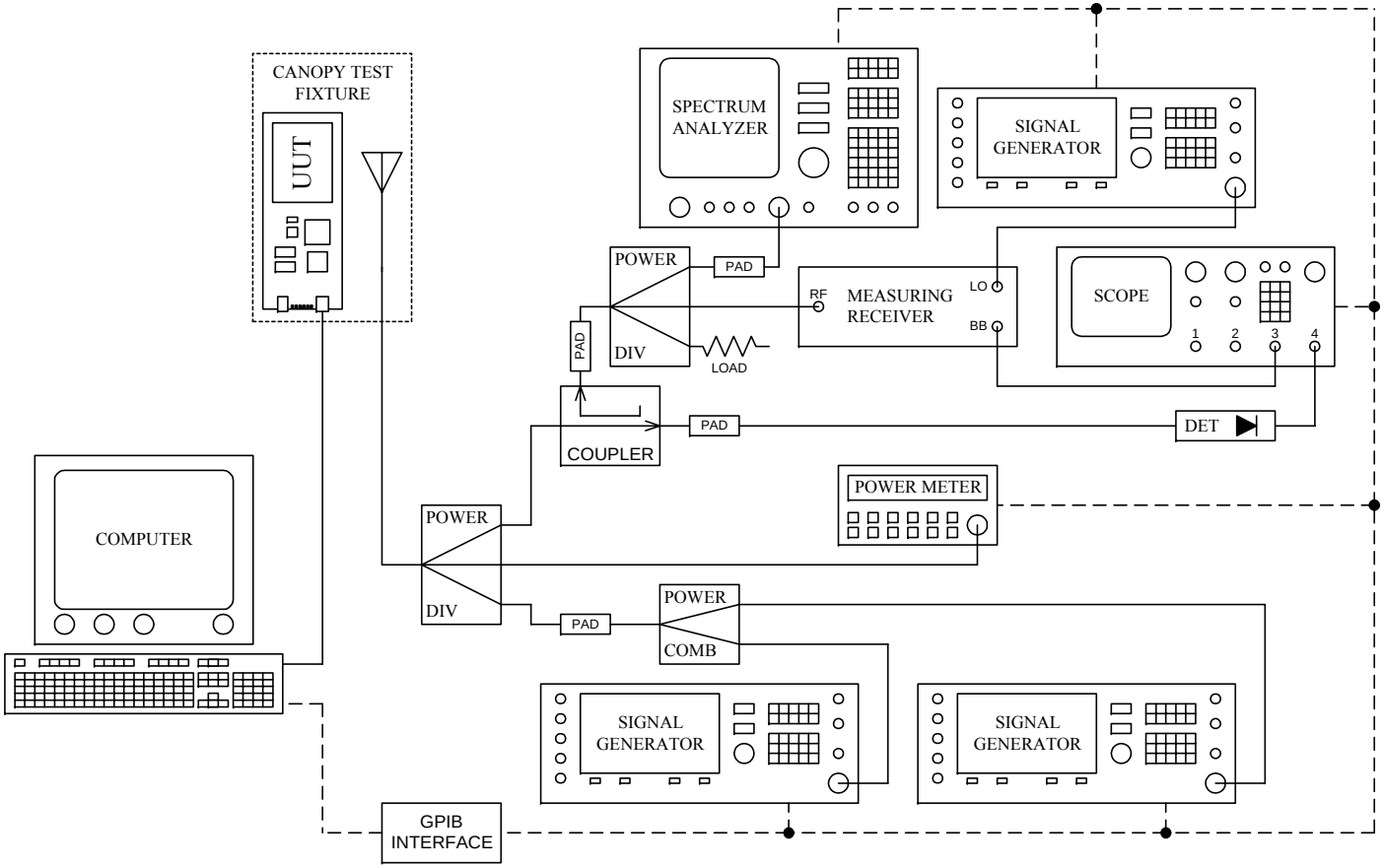
Technical Brief CANOPY Model 9000 Radiated Test

Testing for Compliance with FCC Part 15.247 and RSS-210 Issue 5 Amendment when Operated in the ISM Band

June 30th 2004

Compliance testing with FCC rules part 15.247 and RSS-210 Issue 5 Amendment of Industry Canada was performed in both radiated and conducted fashion since production CANOPY units have an external RF connector that connects to an external patch antenna array. Power spectral density, maximum output power, and occupied bandwidth measurements were made in conducted fashion. Measurements were made on CANOPY unit serial #: 0A003E900026. The test setup diagram is as follows:



Spectrum Analyzer Calibration

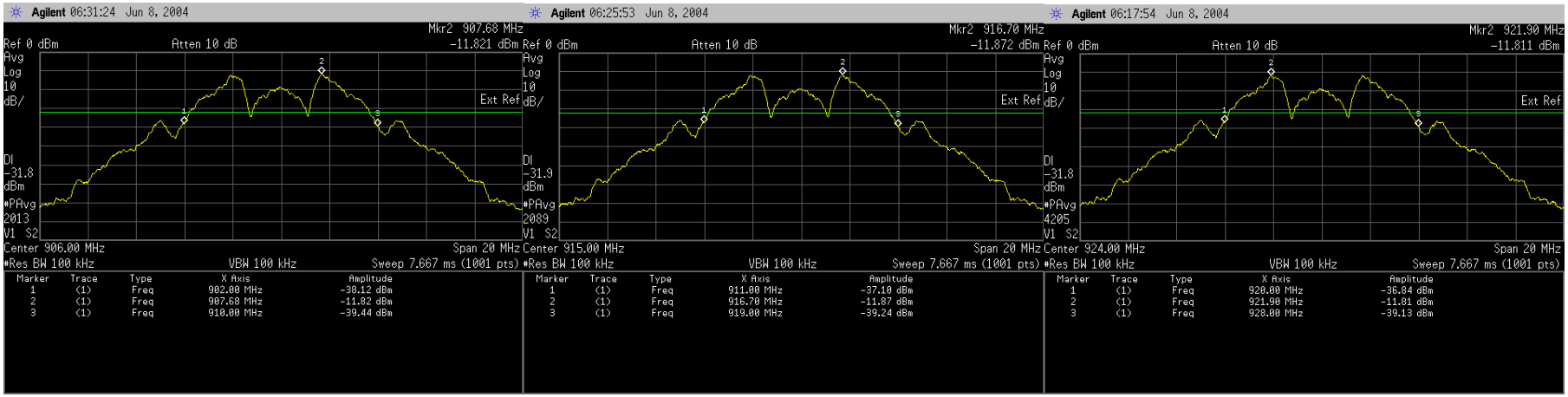
The silent carrier power at all test frequencies was normalized (via the amplitude offset function in the spectrum analyzer) to maximum transmitted output power 28.0 dBm in the analyzer plots. The dBm units in the plots can be read directly for PSD. TX bit error test pattern was initiated at maximum transmit duty cycle and data throughput for the radio under test. This will result in 95.3% duty cycle or an average power versus maximum power ratio of -0.209dB.

Note: The power out of the radio is controlled and limited based upon the dBi gain of the antenna. The canopy system is setup to prevent exceeding 36dBm E.I.R.P. For every dB above 6dB our antenna is, the output is reduced by one dB. This feature is set based on the appropriate mating antenna.

15.247c. and RSS-210 Issue 5 6.2.2(o)(e1) Band Edge Requirements

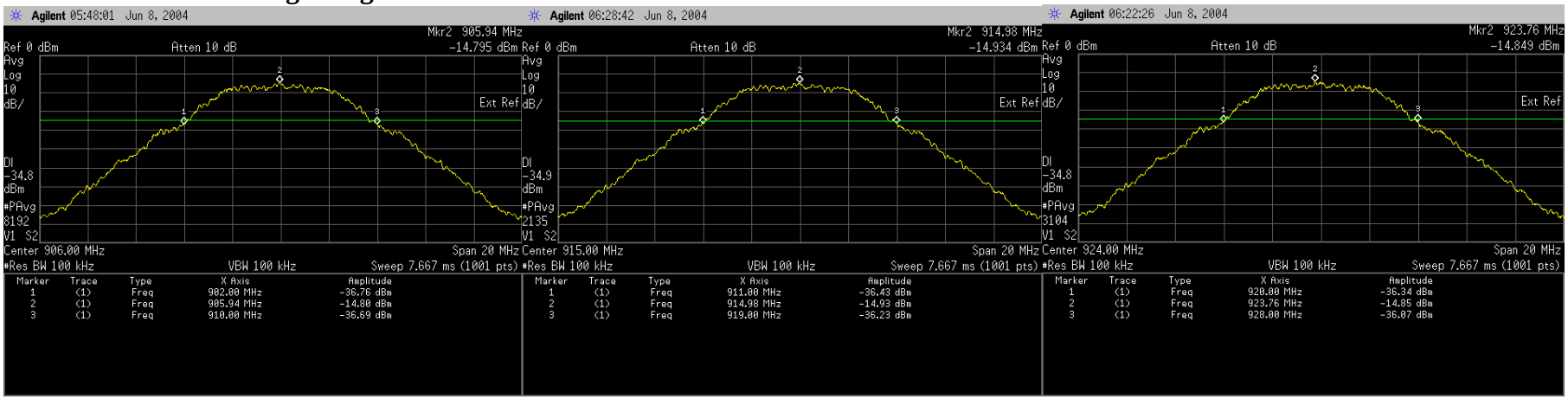
The following plot shows that the CANOPY radio produces an acceptable out-of-band spectral output when operated at the channel limits of 906MHz at the lowest frequency, and 924MHz at the highest frequency. The display line indicated the –20dB from maximum in-band specification limit for non-restricted out-of-band spectral emissions.

2-Level FSK – 3.3Mb Signaling



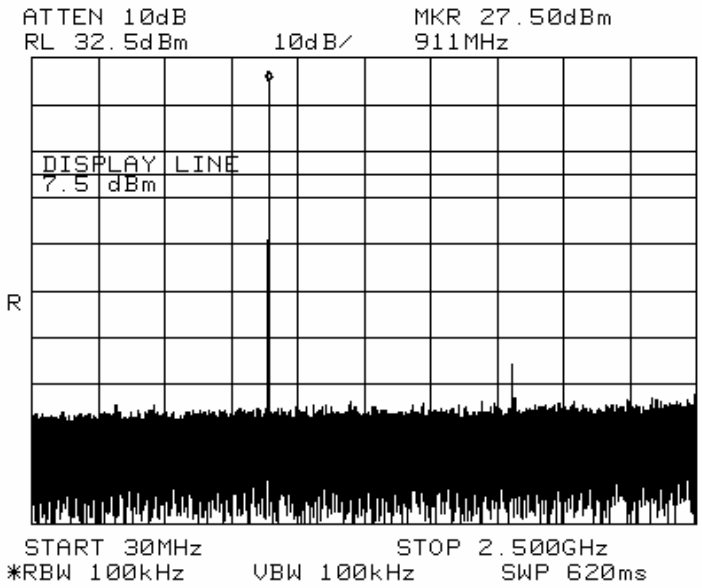
The test results indicated that the band-edge spectral emissions were more than 20dB below the in-band power for both 2FSK and 4FSK modulation modes. The carrier frequencies tested were 906MHz 915MHz and 924MHz.

4-Level FSK – 6.6Mb Signaling

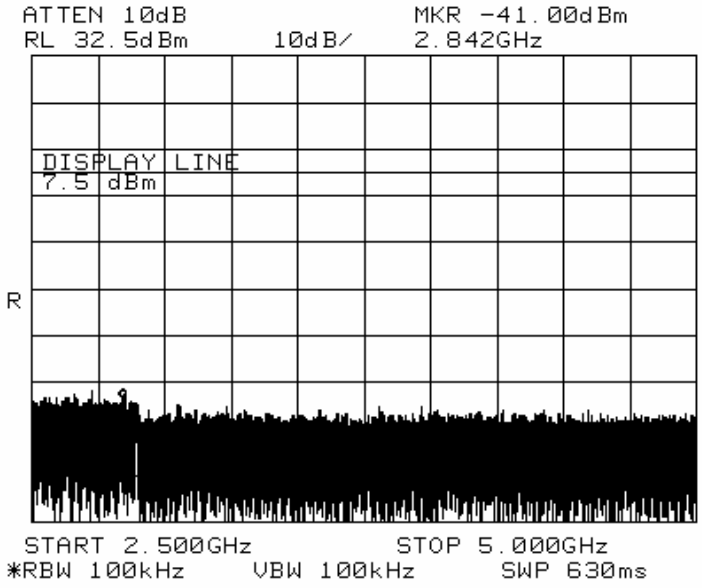


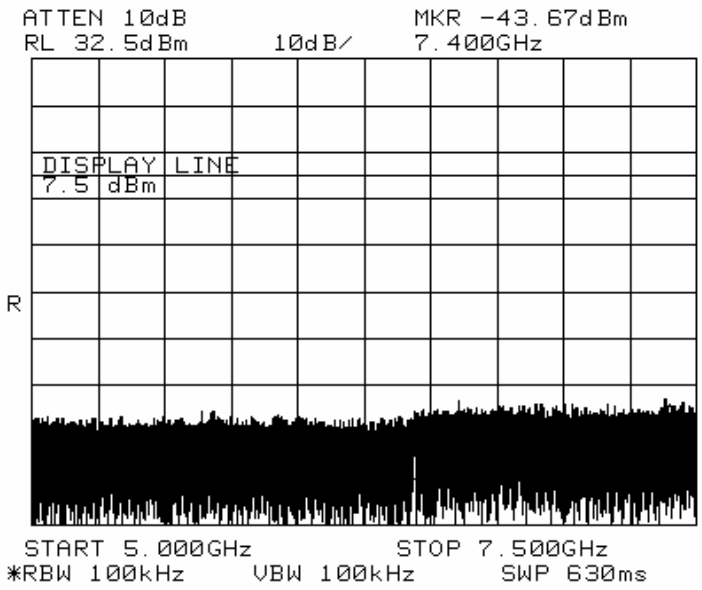
The test results indicated that the band-edge spectral emissions were more than 20dB below the in-band power for both 2FSK and 4FSK modulation modes. The carrier frequencies tested were 906MHz 915MHz and 924MHz.

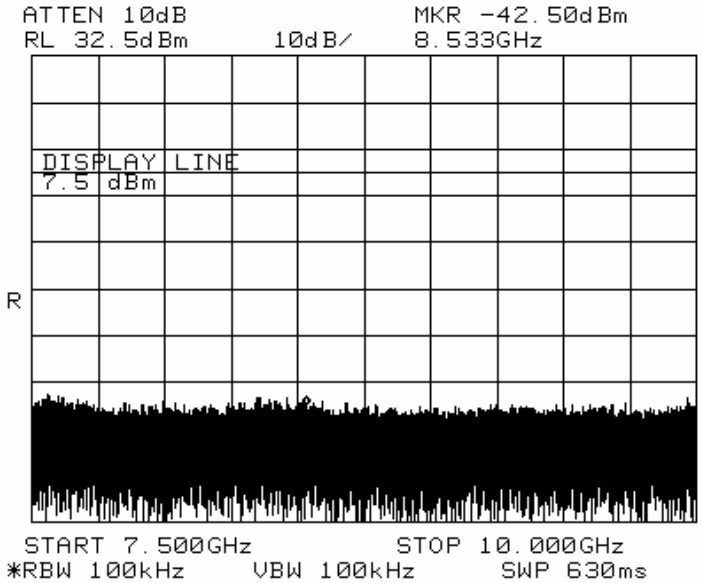
Conducted data from 30MHz to 10 GHz, radio serial#OA003E900026
Carrier frequency is set to 906MHz.



Note the display line is 20 dB below the carrier which is set for max power.

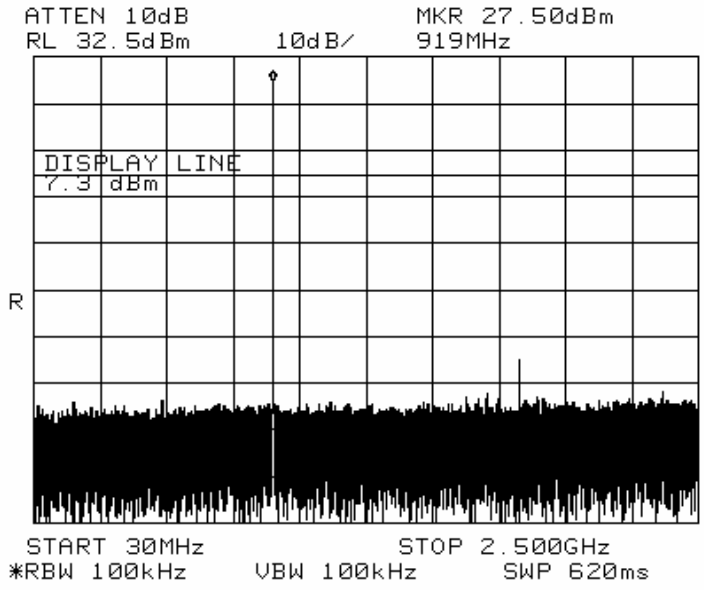


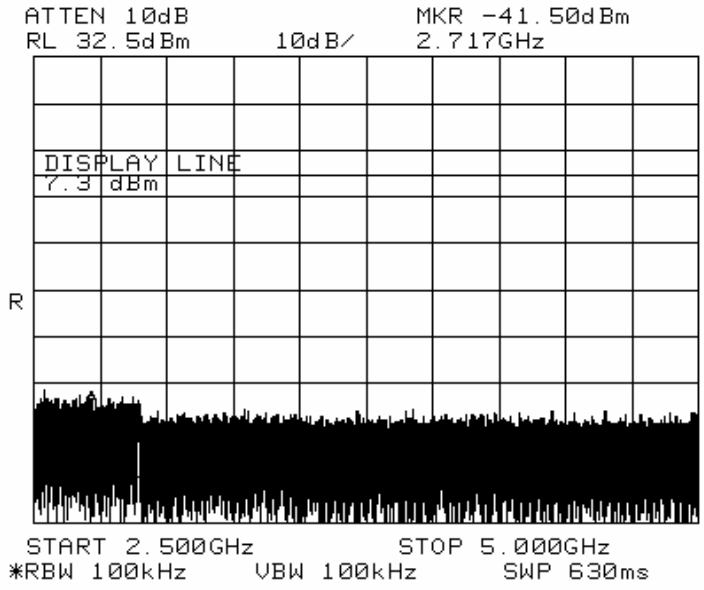


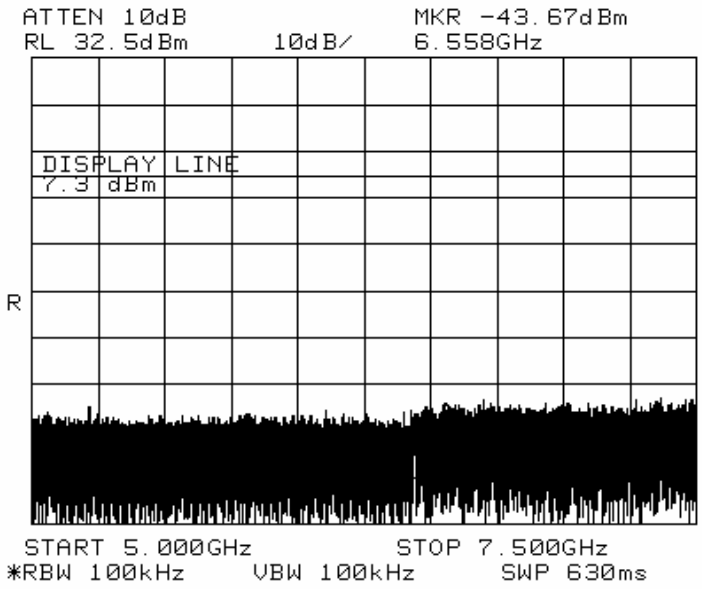


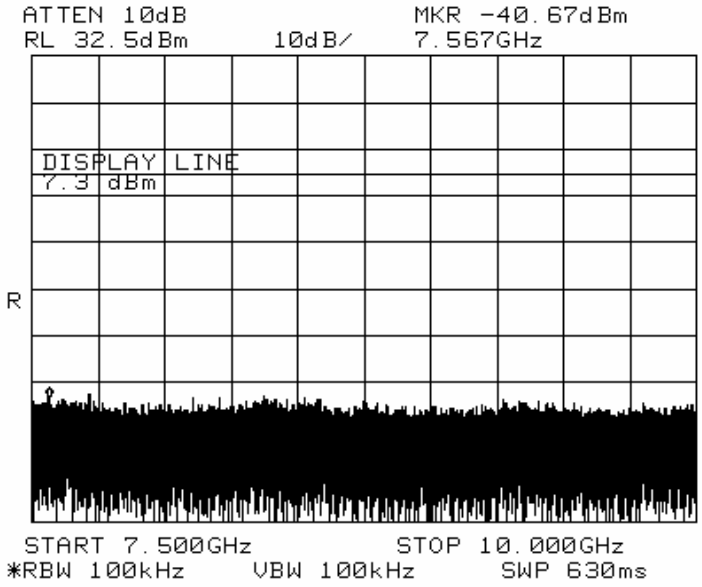
No spurious emissions were detected that occurred within the 20 dB window from 30MHz to 10GHz.

Carrier frequency is set to 915MHz.



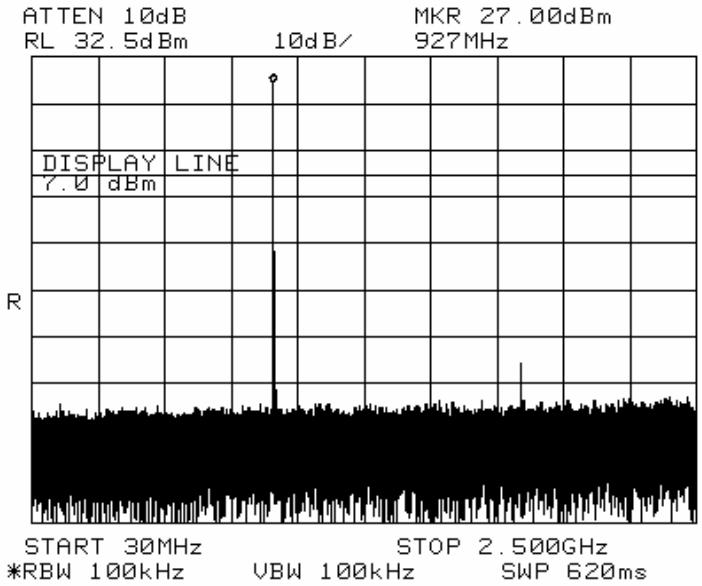


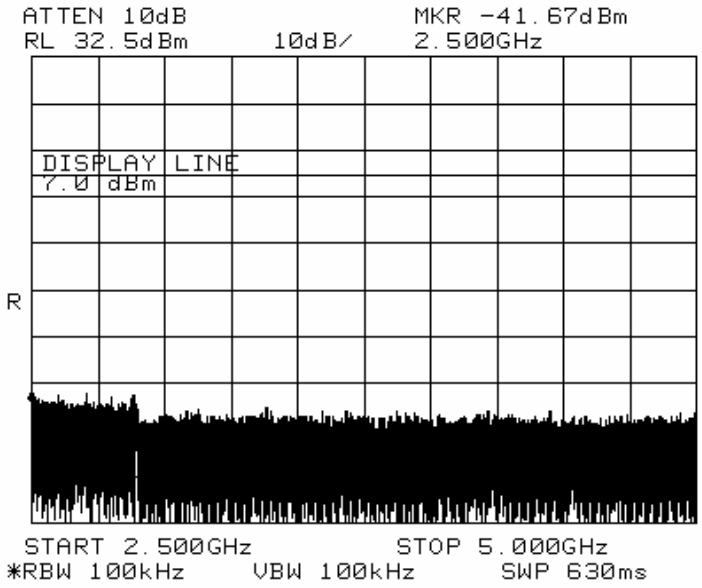


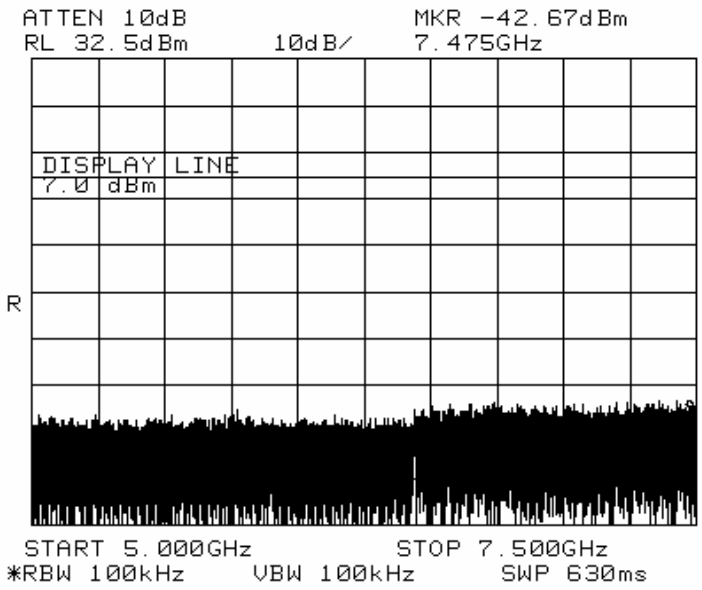


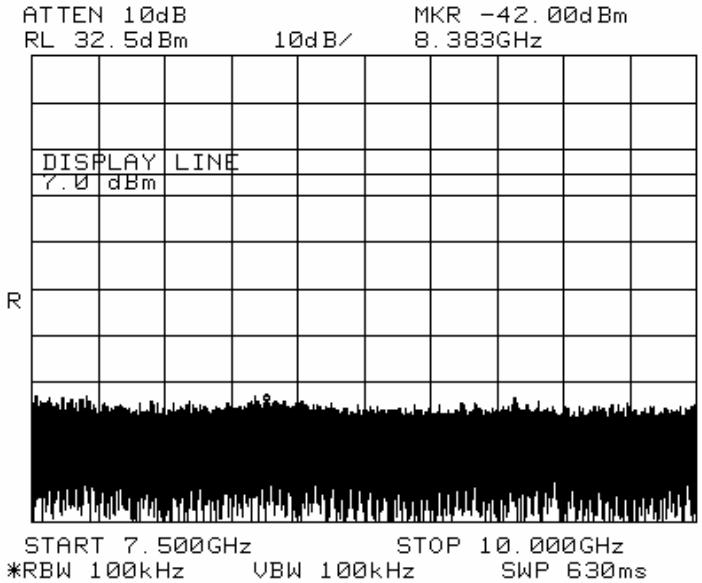
No spurious emissions were detected that occurred within the 20 dB window from 30MHz to 10GHz.

Carrier frequency is set to 924MHz.







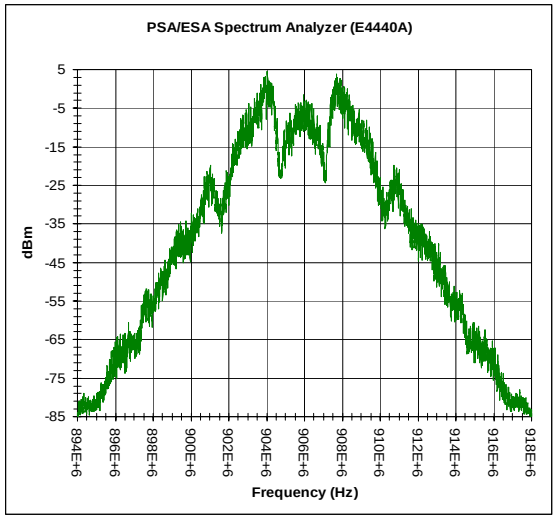


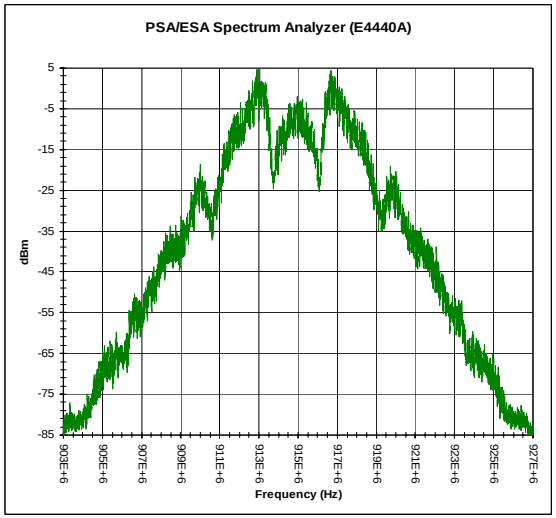
No spurious emissions were detected that occurred within the 20 dB window from 30MHz to 10GHz.

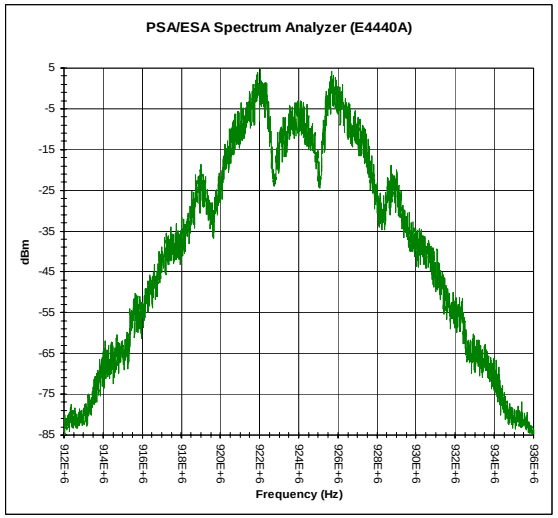
15.247d. and RSS-210 Issue 5 6.2.2(o) Amendment Conducted Peak Power Spectral Density

The plots shown below display the peak power spectral density results for the radio operation in the frequency band 902-928MHz. The carrier power (a conducted measurement) at the antenna connector was 27.974dBm maximum at 915MHz. At 906MHz the carrier power was 27.923 dBm. At 924MHz the carrier power was 28.072 dBm

2-Level FSK – 3.3Mb Signaling

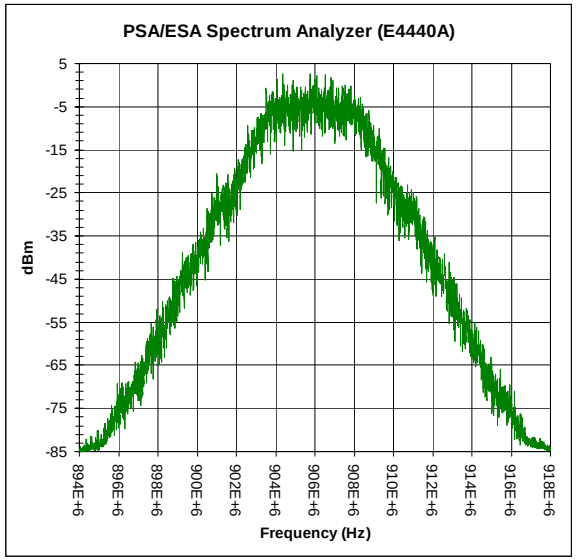


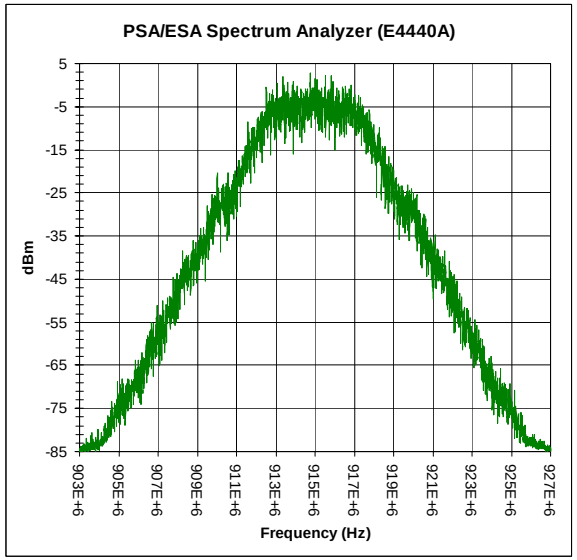


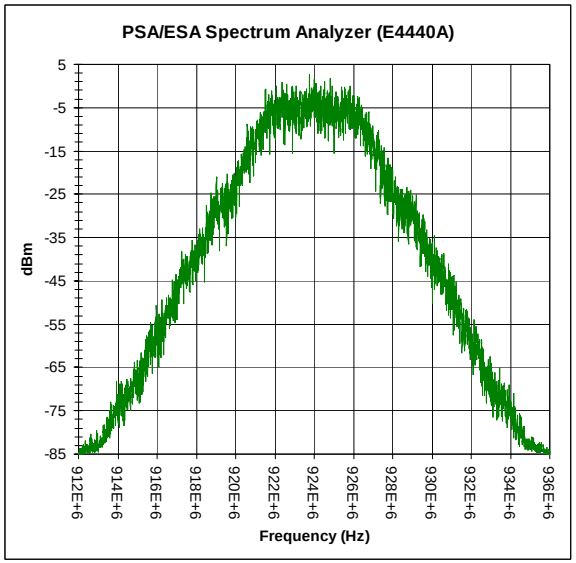


2FSK Modulation Results: The maximum peak power spectral density when measured in a 3kHz resolution bandwidth was measured to be 5.409dBm at the mid operating frequency of 915MHz. At the uppermost operating frequency of 924MHz, the maximum peak power spectral density was measured to be 4.973dBm. At the lowest operating frequency, 906MHz, the maximum peak power spectral density was measured to be 4.513dBm. The specification limit for this measurement was 8dBm for the unit under test.
The test results show we have 2.591dB margin worst case.

4-Level FSK – 3.3Mb Signaling







4FSK Modulation Results:
The maximum peak power spectral density when measured in a 3kHz resolution bandwidth was measured to be 2.775dBm at the mid operating frequency of 915MHz. At the uppermost operating frequency of 924MHz, the maximum peak power spectral density was measured to be 2.572dBm. At the lowest operating frequency, 906MHz, the maximum peak power spectral density was measured to be 2.524dBm. The specification limit for this measurement was 8dBm for the unit under test.
The test results show we have 5.225dB margin worst case.

CANOPY Model 9000 Radiated Test

Testing for Compliance with FCC Part 15.209 and RSS-210 Issue 5 6.2.2(o) when Operated in the ISM Band

June 30th 2004

CANOPY 9000 ISM units, serial #: 0A003E900026 was tested outdoors to check compliance with FCC requirement 15.209 and RSS-210 Issue 5 6.2.2(o) of IC, restricted band emissions for ISM data-modulated radios. The CANOPY 9000 radio was tested for the following harmonic and LO spurious frequencies. See Table below.

Open Field Emission Measurement Table for Canopy Model 9000										
900 MHz Radio	Tx Freq. tested	*Canadian and FCC restricted bands are in gray*								
	Fundamental	2nd Harmonic	3rd	4th	5th	6th	7th	8th	9th	10th
(TX) MHz	906	1812	2718	3624	4530	5436	6342	7248	8154	9060
(TX) MHz	915	1830	2745	3660	4575	5490	6405	7320	8235	9150
(TX) MHz	924	1848	2772	3696	4620	5544	6468	7392	8316	9240

The testing was done using a model 3115 calibrated dual-ridged waveguide-horn antenna manufactured by EMCO, Inc., an Agilent 8564E 40GHz spectrum analyzer, and a laptop to control the DUT and take data from the spectrum analyzer. The horn antenna allowed a frequency measurement range of 0.75GHz to 10GHz. The spatial separation between the EMCO horn antenna and the DUT was maintained at 3 meters during the test.

The FCC requirement for restricted band emissions is stated in terms of field strength at 500uV/m at a distance of 3 meters. This limit was the pass/fail criteria for the test. Cable losses, antenna gains, and other correction factors were entered into an Excel spreadsheet along with the results of the testing.

To calculate the power density at the horn antenna, the power level received by the antenna is offset by the log ratio of the effective aperture of the antenna to one square meter. The calculation of the effective aperture is done using:

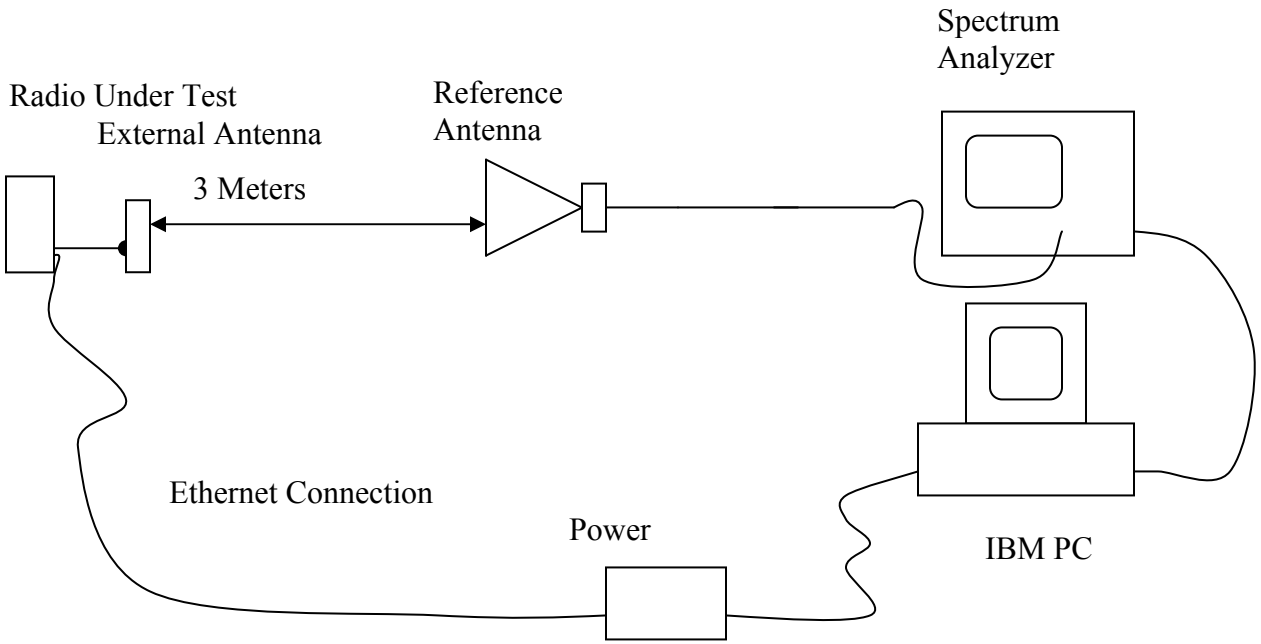
$$A_{em} = e_{cd}(\lambda^2/4\pi)D_{o,}$$

D_o is the directivity of the antenna, e_{cd} is the efficiency, and λ is the wavelength of the frequency under observation. In the equation, e_{cd} and D_o may be replaced by the numeric gain of the antenna. Using the calibration data from the manufacturer, the effective area of the antenna was computed for each measurement frequency and the appropriate dB correction factor applied.

The test antenna and test radio were mounted on adjustable tripods and placed 3 meters apart.

Andrew antenna 3meter testing

The test setup diagram is as follows:



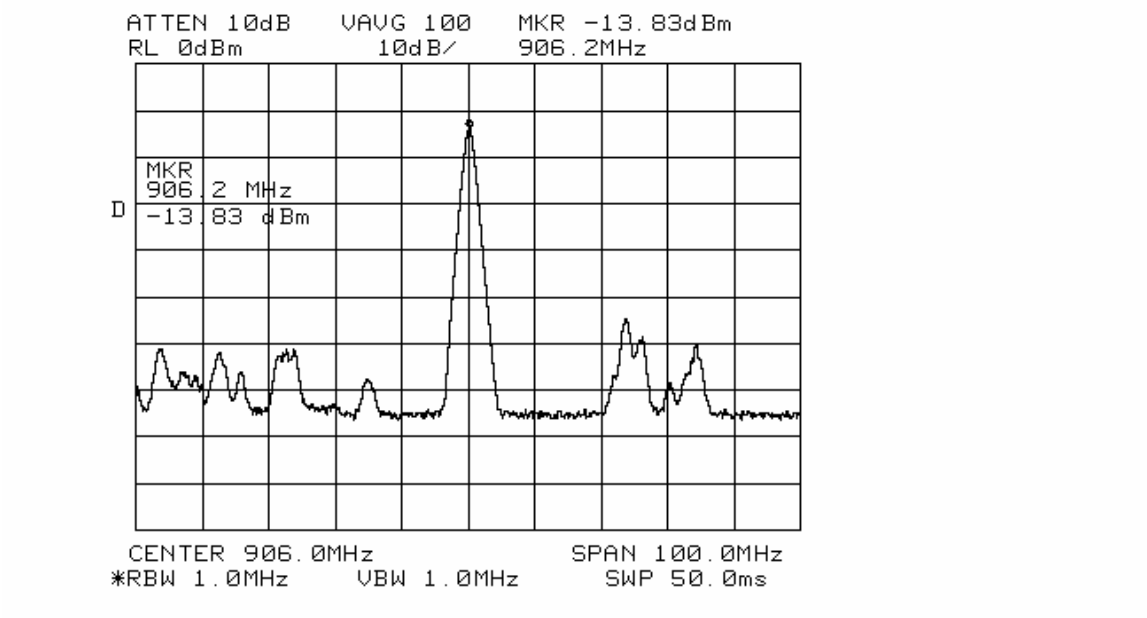
An EMCO model 3115 ridged-waveguide horn antenna covering the 0.75GHz to 18GHz frequency range was used. The antenna is calibrated for a 3-meter distance.

The radio has a CW mode for testing purposes and was used to measure the harmonic levels radiated from the radio. In normal mode operation, the modulated spectrum of the radio has a lower power-spectral density, making accurate measurements difficult. With no modulation, the measurement bandwidth could be reduced to 1kHz, allowing greater dynamic range for the test equipment. Typically, measurements were made using a 30kHz resolution bandwidth and a 500kHz bandwidth.

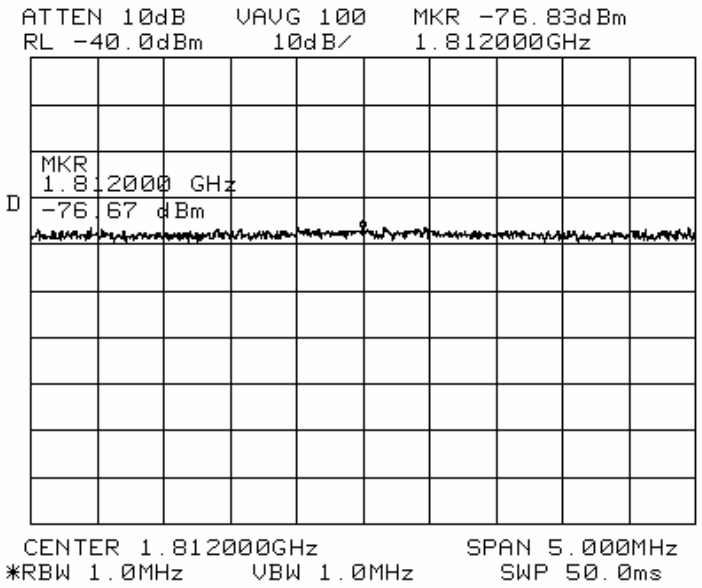
Harmonic and LO spurious emissions were tested to FCC 15.209 and RSS-210 of IC for compliance into the ISM band for our RF frequency range of the Canopy 900 band radio on the Advanced Logic hardware platform. All channels in the ISM band were looked at and the worst case was 906MHz for LO spurious. Harmonic data was the similar on each channel only 906MHz had slightly higher 3rd harmonic. Data from the analyzer was transferred to the laptop computer and later processed. DLS, a local test facility registered with FCC O.A.T.S. #31040/SIT, Industry Canada Registration for Site 3: 2060-3. DLS tested the antenna below 1GHz. Harmonic data was then tested by Motorola using our open area test site #IC4327 and FCC#9081

Transmitter Harmonic Test Data at 906 MHz (ANDREW)

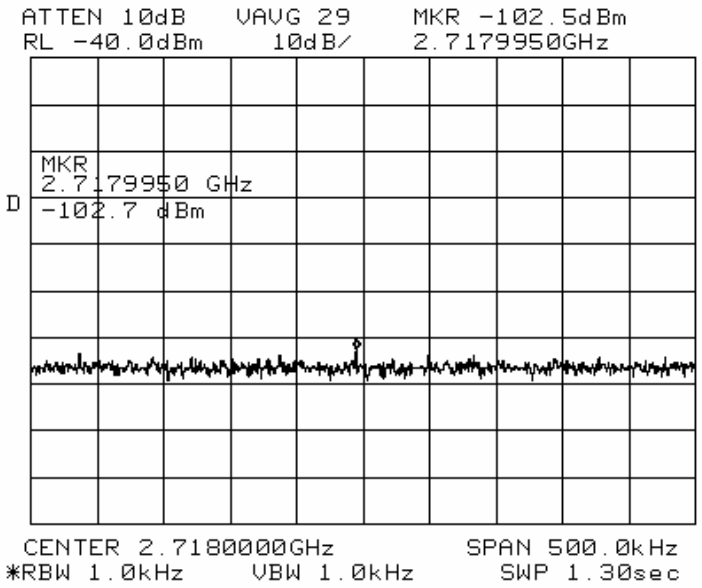
Plot 1: TX 906 MHz Fundamental, RBW= 1MHz



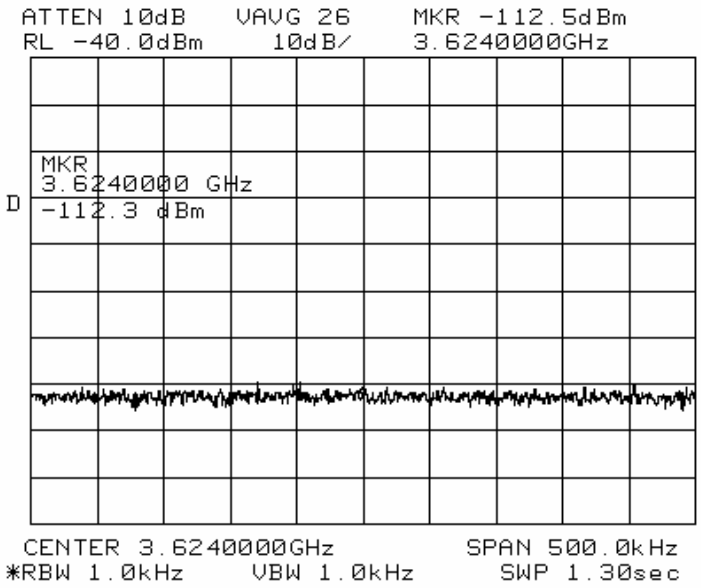
Plot 2 : TX 2nd Harmonic, RBW = 1MHz



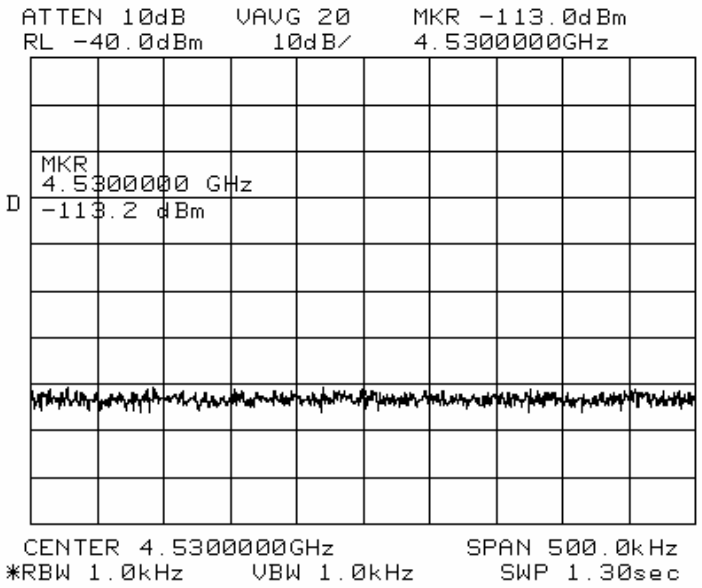
Plot 3: TX 3RD Harmonic, RBW = 1kHz



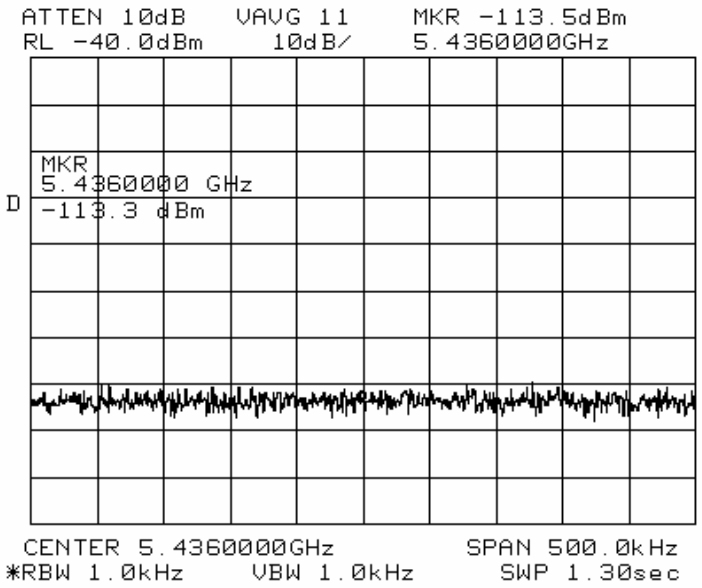
Plot 4: TX 4TH Harmonic, RBW = 1kHz



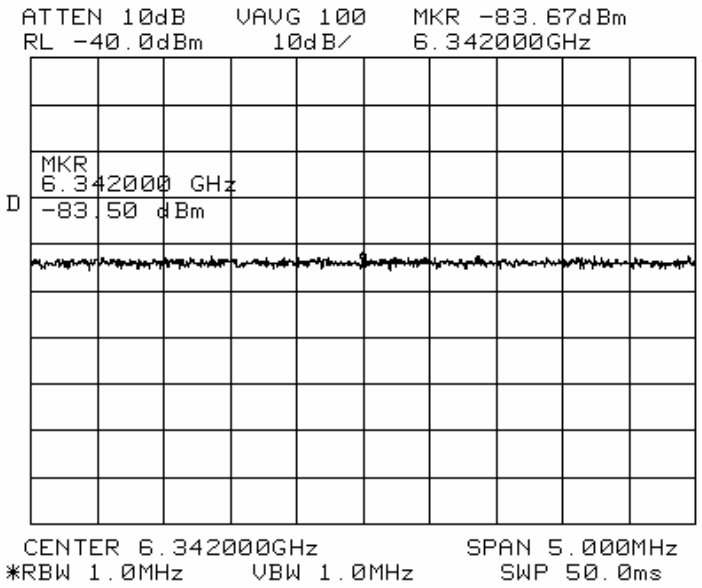
Plot 5: TX 5TH Harmonic, RBW = 1kHz



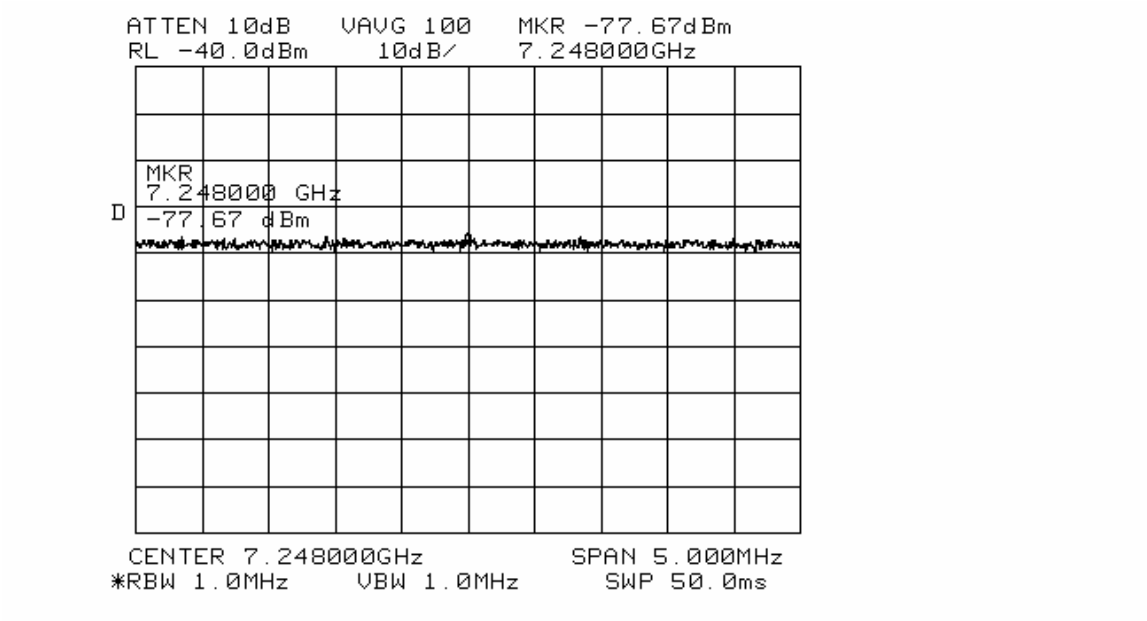
Plot 6: TX 6TH Harmonic, RBW = 1kHz



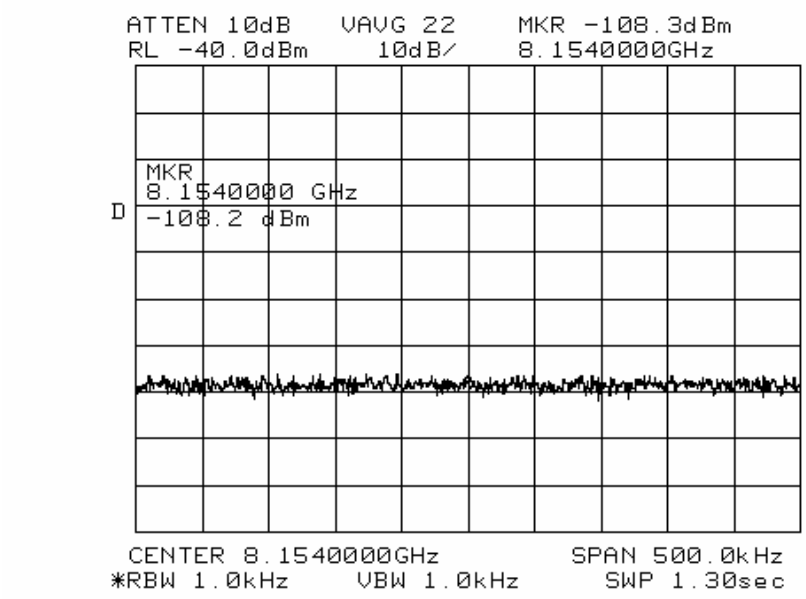
Plot 7: TX 7TH Harmonic, RBW = 1MHz



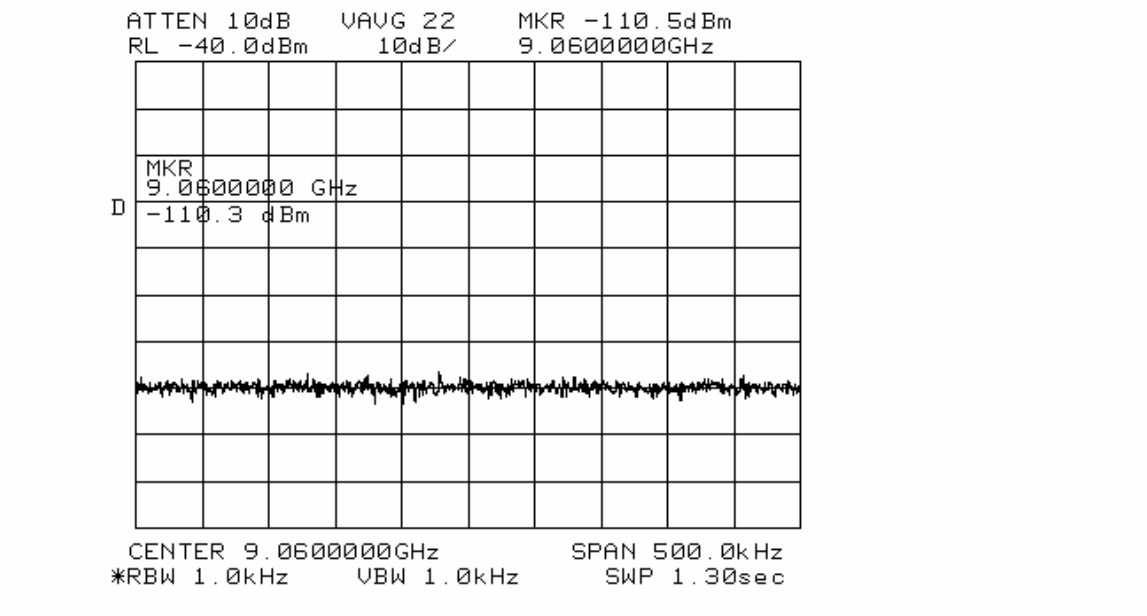
Plot 8: TX 8TH Harmonic, RBW = 1MHz



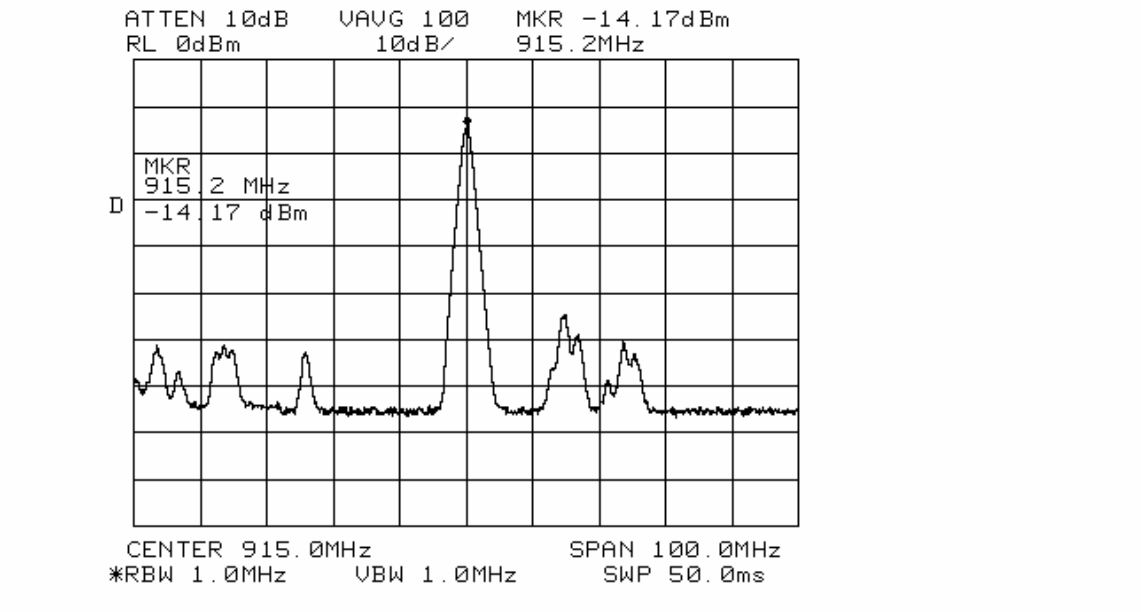
Plot 9: TX 9TH Harmonic, RBW = 1kHz



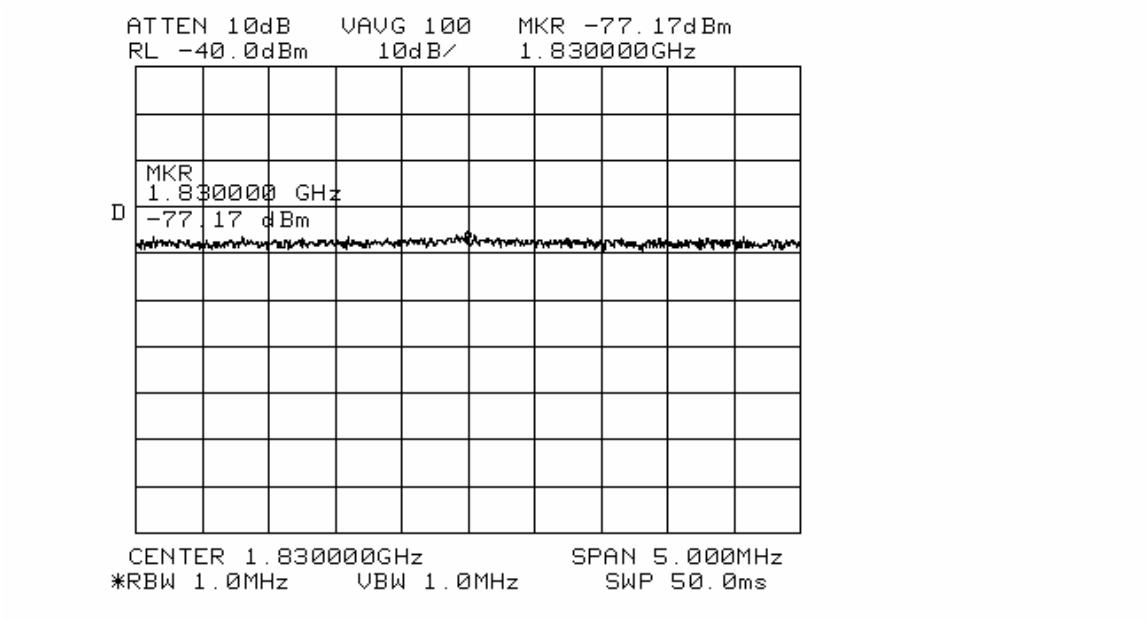
Plot 10: TX 10TH Harmonic, RBW = 1kHz



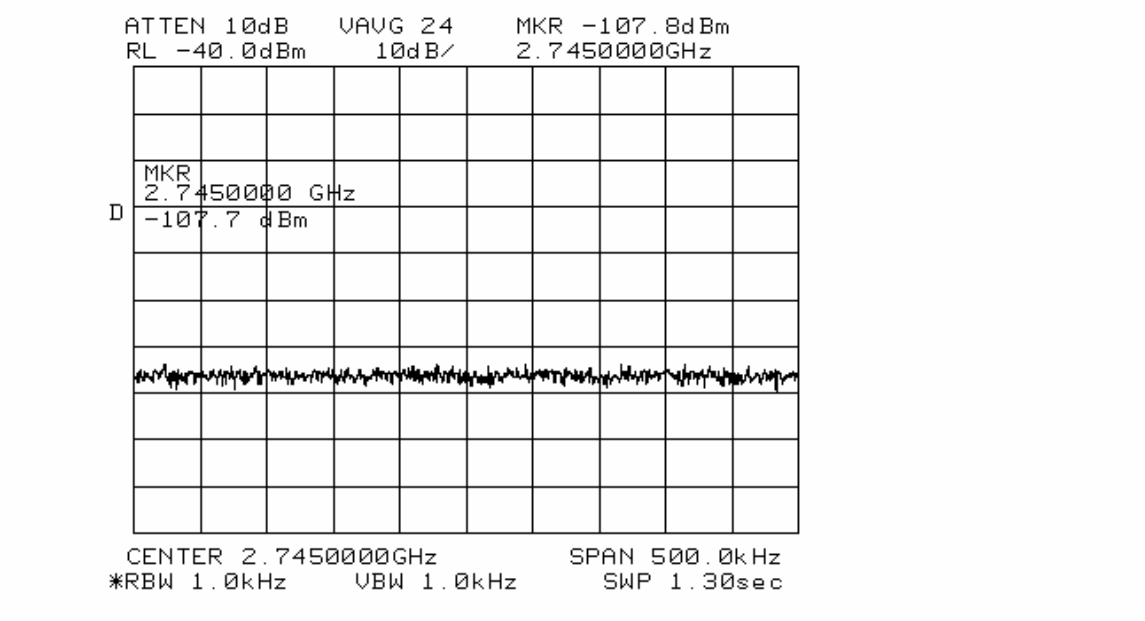
Transmitter Harmonic Test Data at 915MHz (Andrew)
Plot 11: TX 915MHz Fundamental, RBW = 1MHz



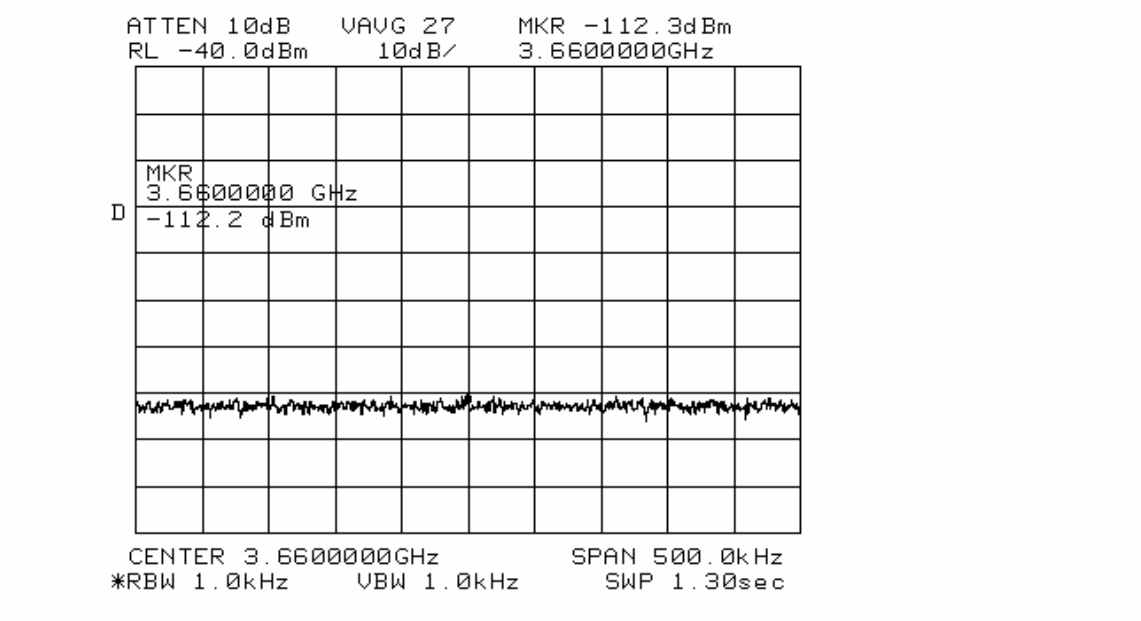
Plot 12: TX 2ND Harmonic, RBW = 1MHz



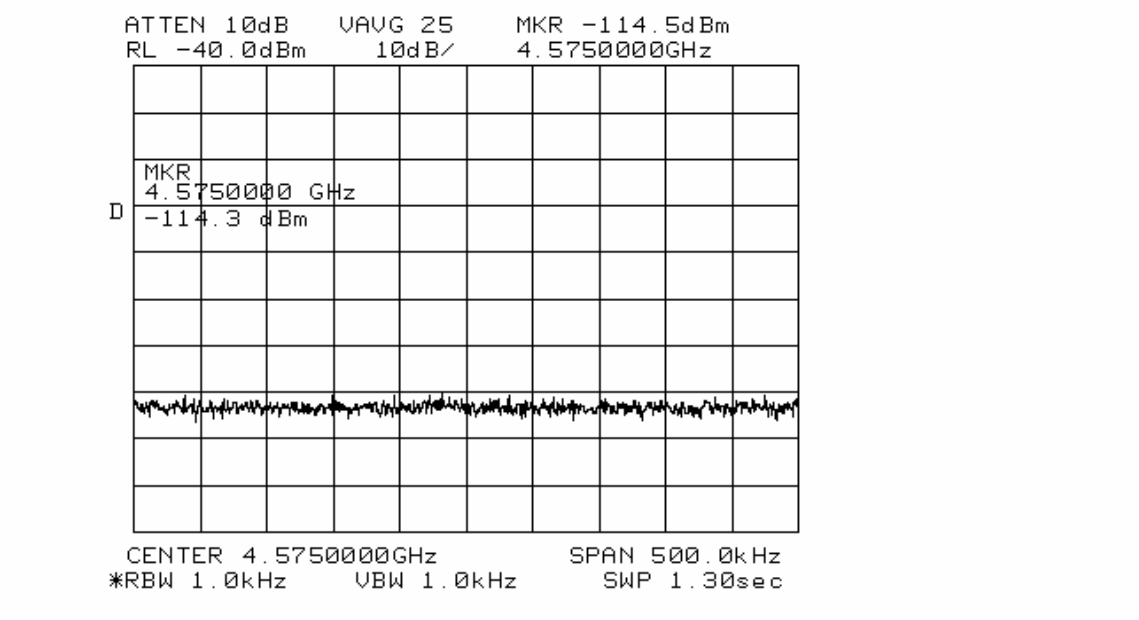
Plot 13: TX 3RD Harmonic, RBW = 1kHz



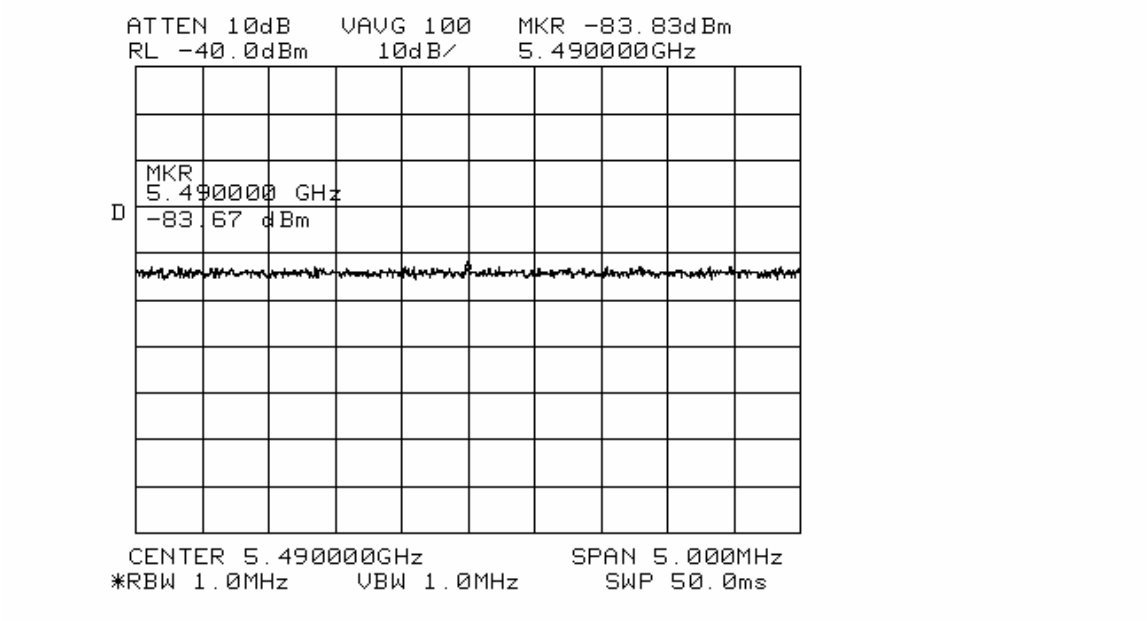
Plot 14: TX 4TH Harmonic, RBW = 1kHz



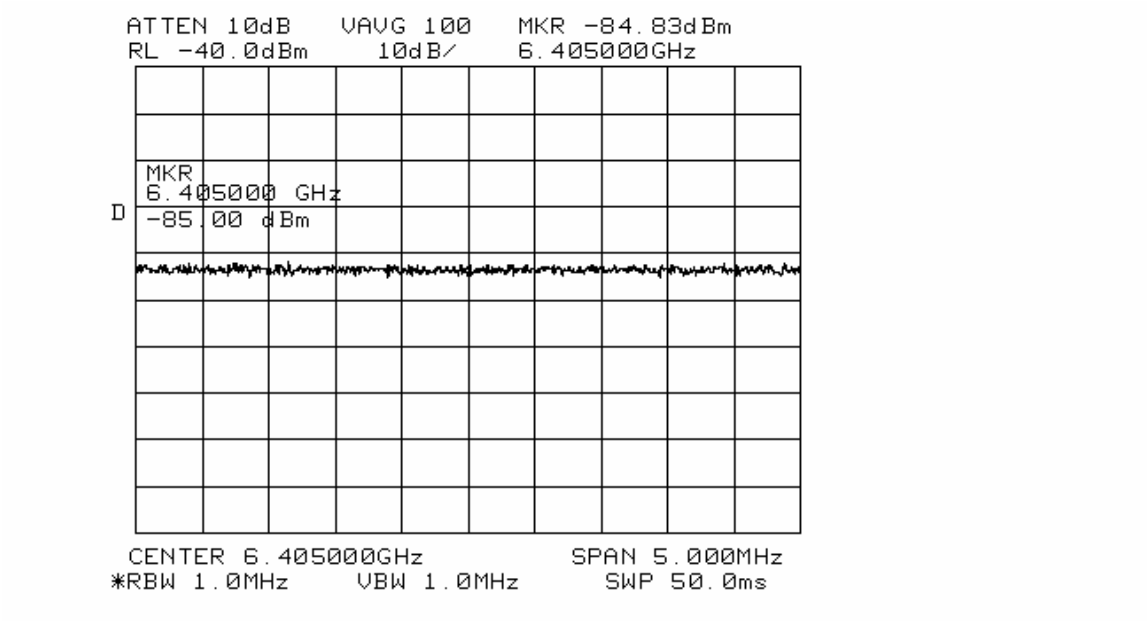
Plot 15: TX 5TH Harmonic, RBW = 1kHz



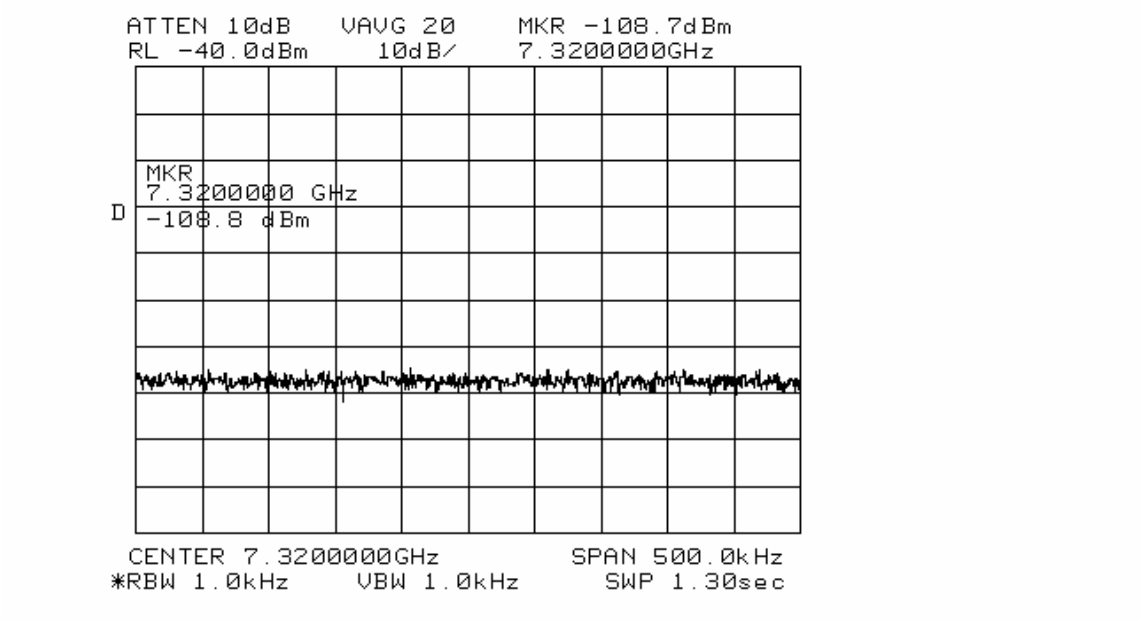
Plot 16: TX 6TH Harmonic, RBW = 1MHz



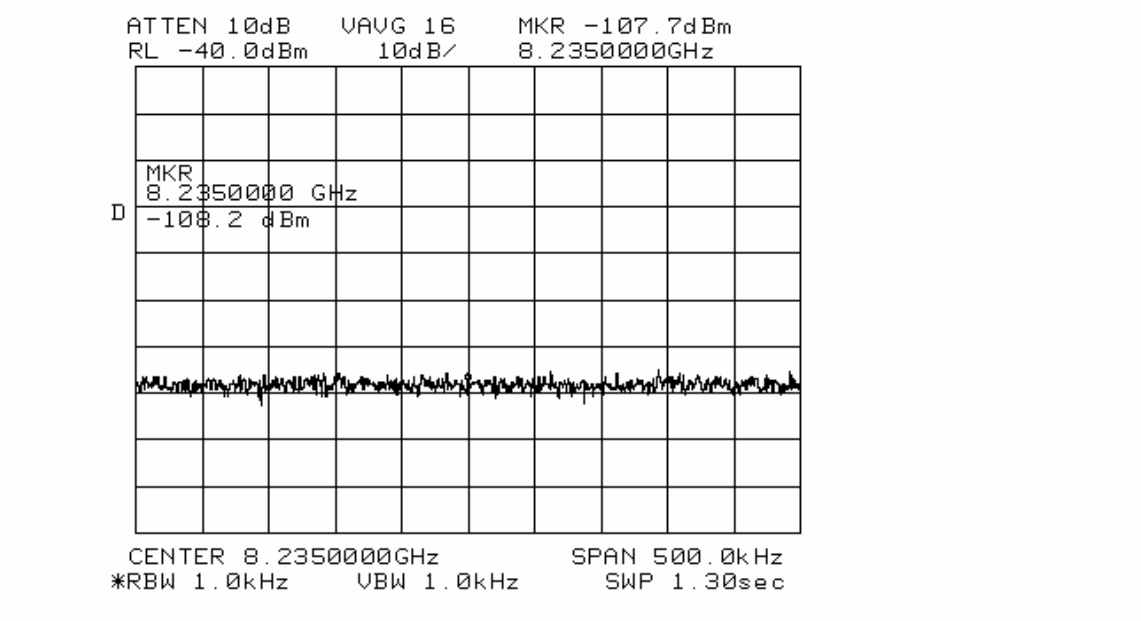
Plot 17: TX 7TH Harmonic, RBW = 1MHz



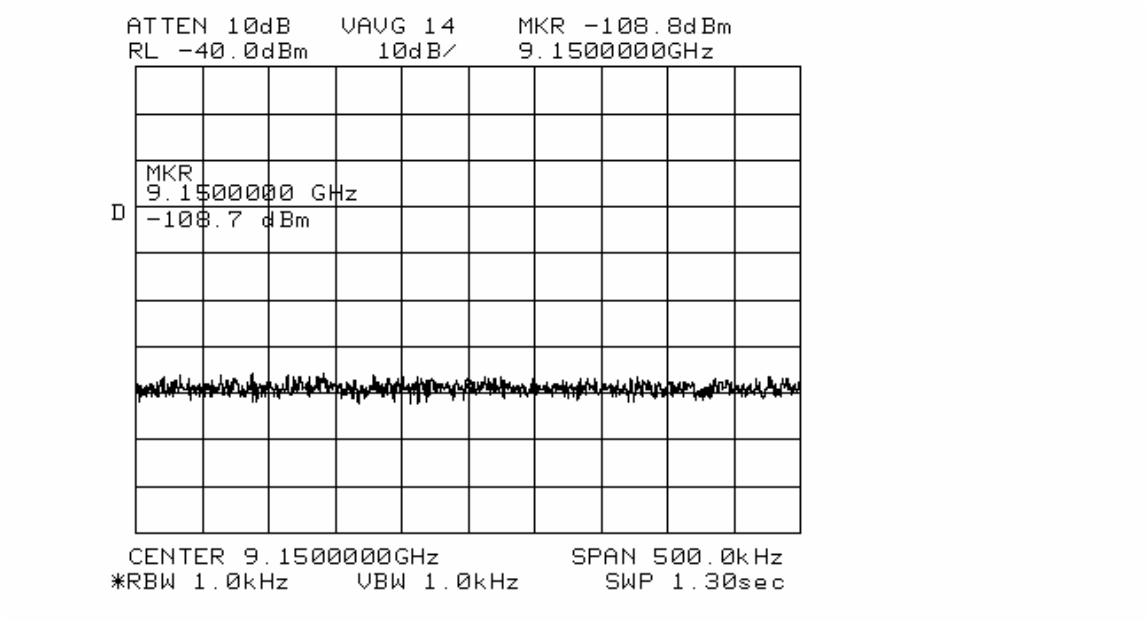
Plot 18: TX 8TH Harmonic, RBW = 1kHz



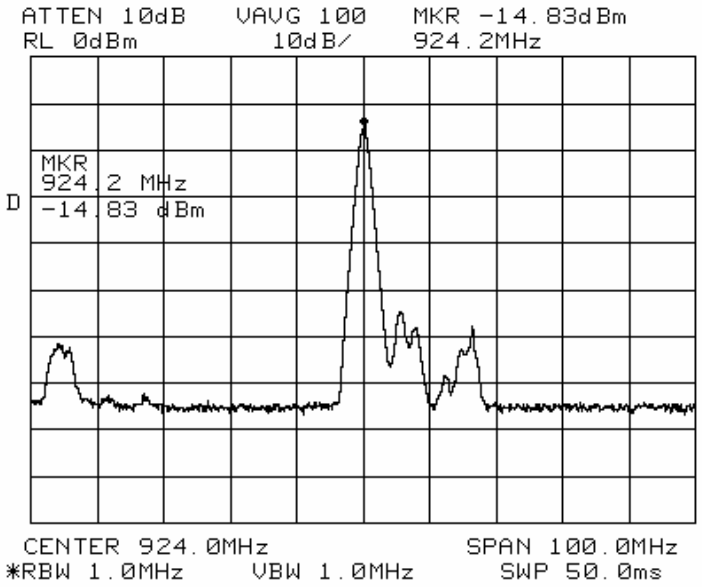
Plot 19: TX 9TH Harmonic, RBW = 1kHz



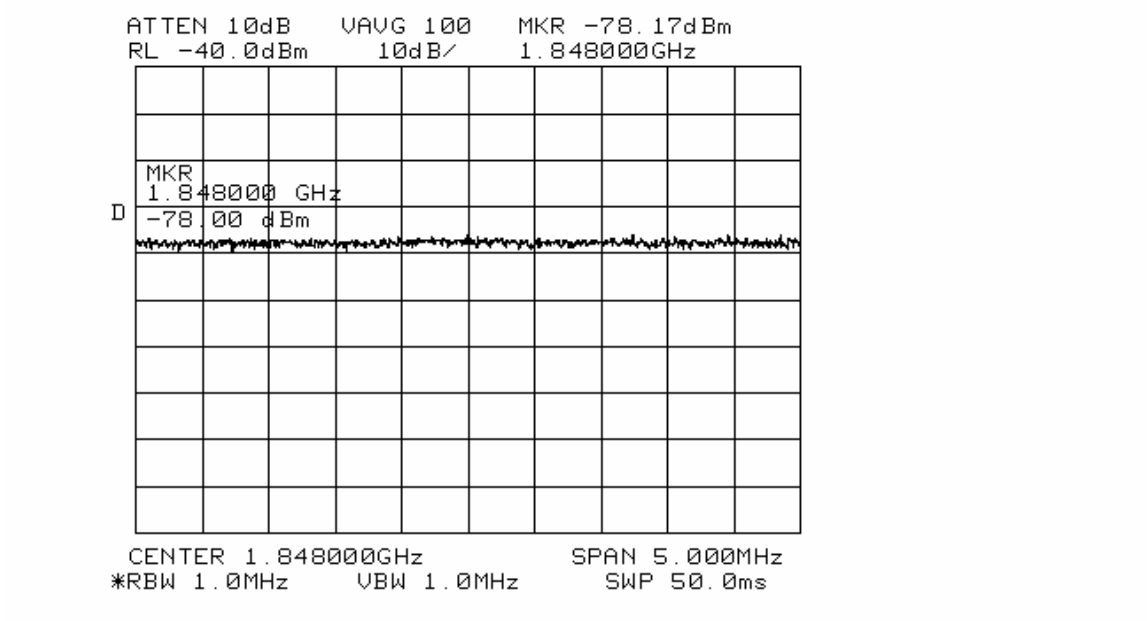
Plot 20: TX 10TH Harmonic, RBW = 1kHz



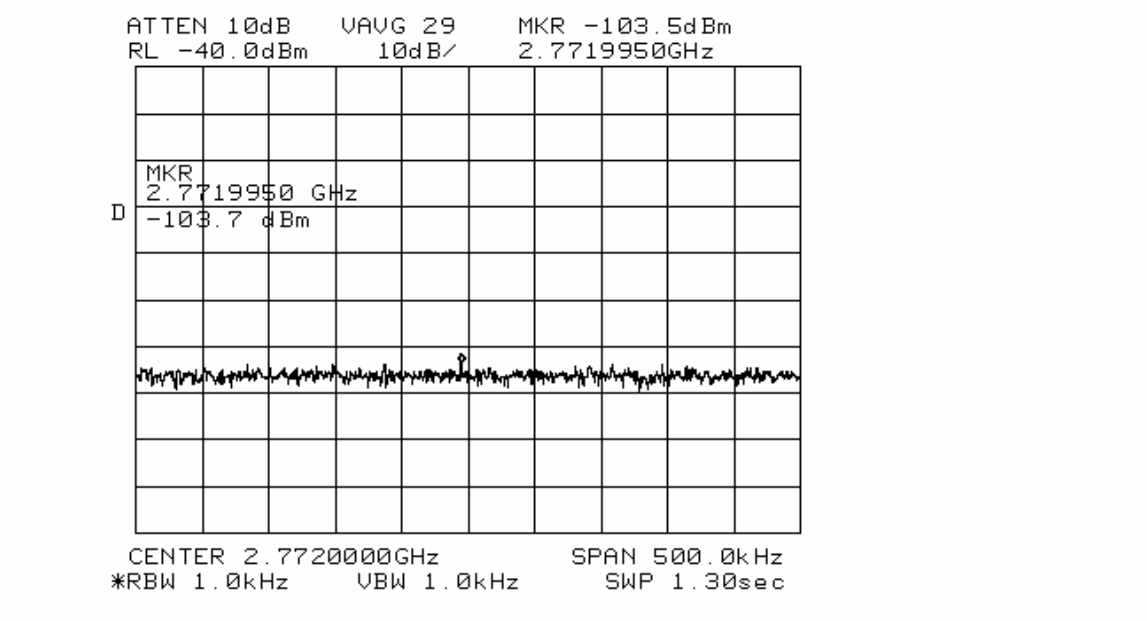
Transmitter Harmonic Test Data at 924MHz (Andrew)
Plot 21: TX 924MHz Fundamental, RBW = 1MHz



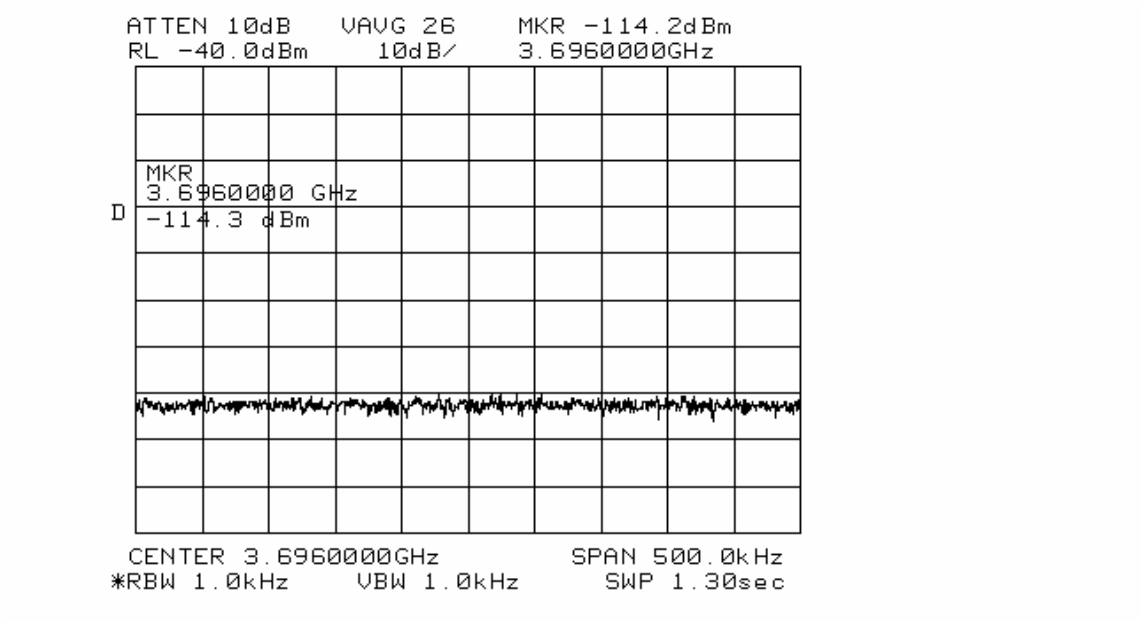
Plot 22: TX 2ND Harmonic, RBW = 1MHz



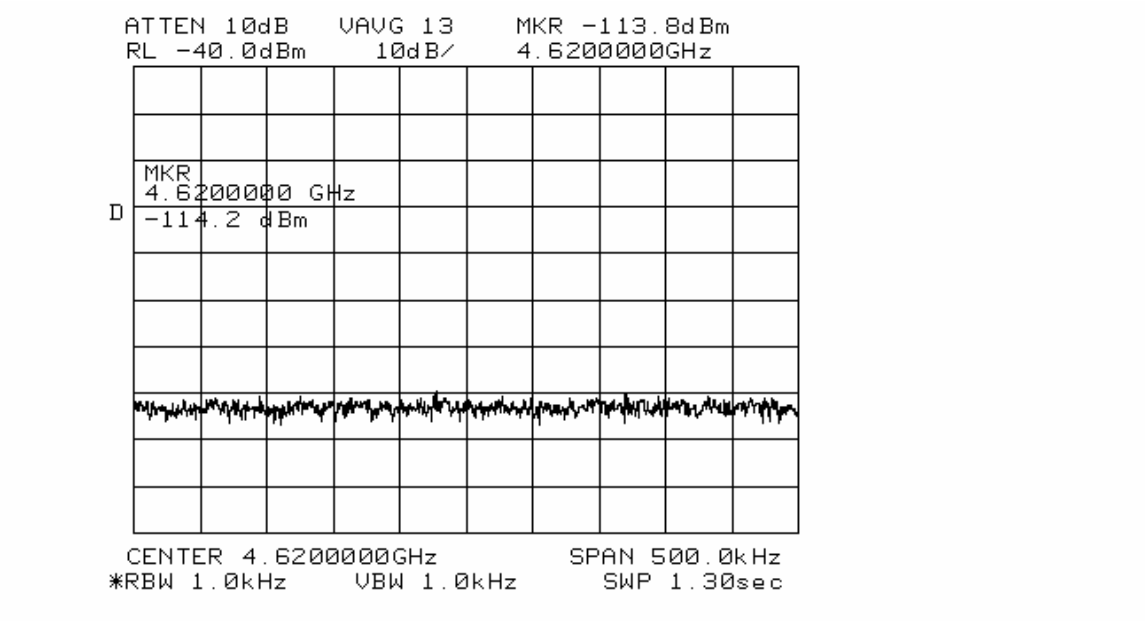
Plot 23: TX 3RD Harmonic, RBW = 1kHz



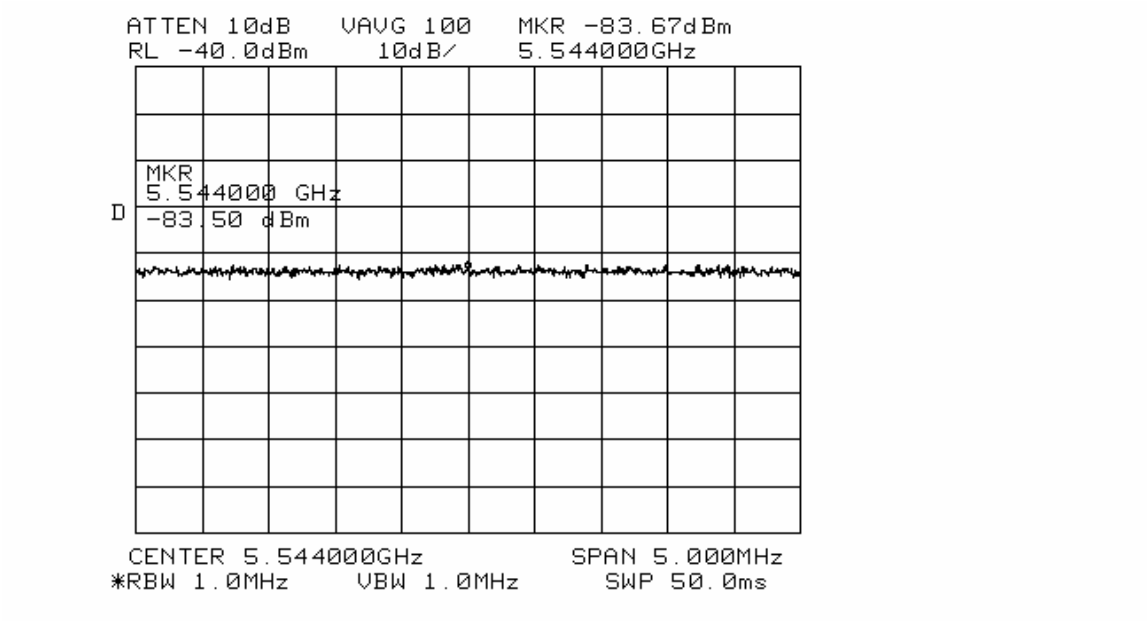
Plot 24: TX 4TH Harmonic, RBW = 1kHz



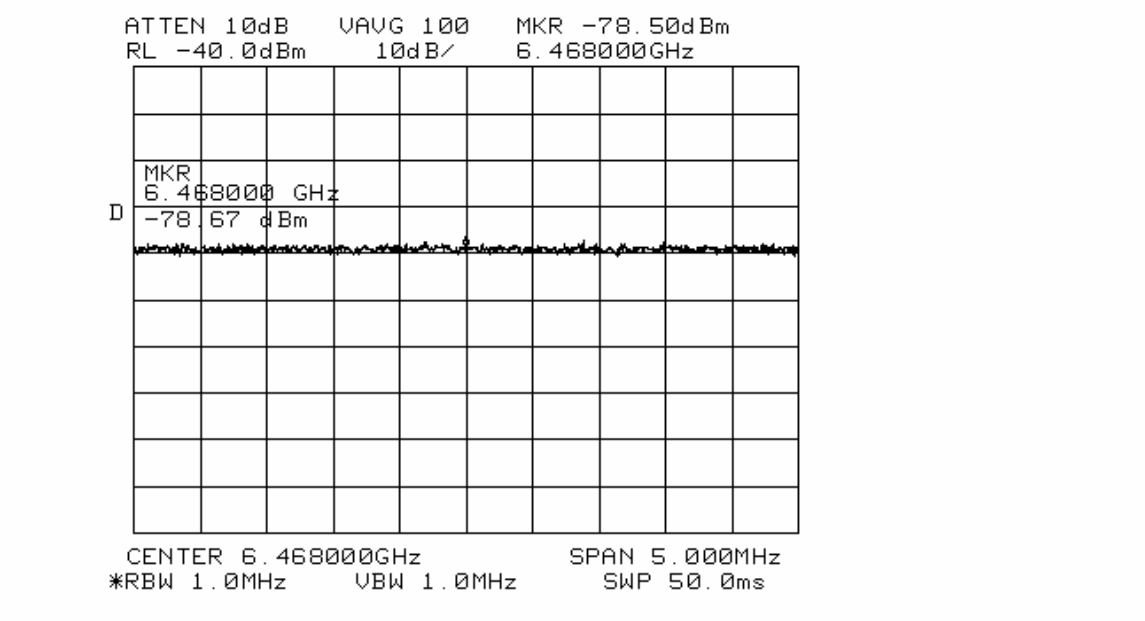
Plot 25: TX 5TH Harmonic, RBW = 1kHz



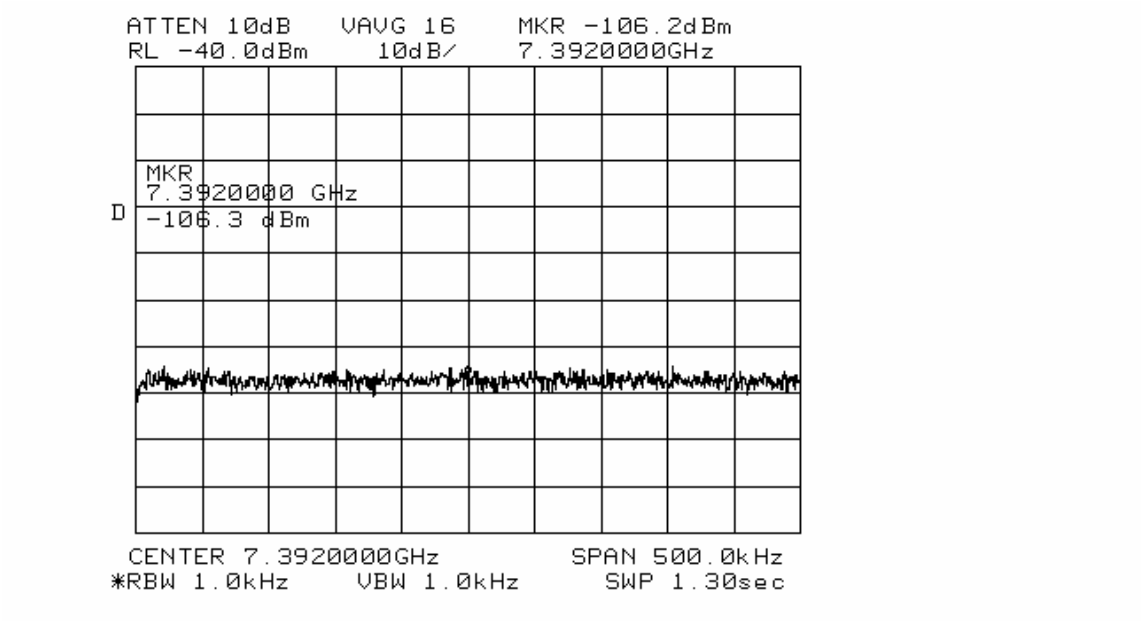
Plot 26: TX 6TH Harmonic, RBW = 1MHz



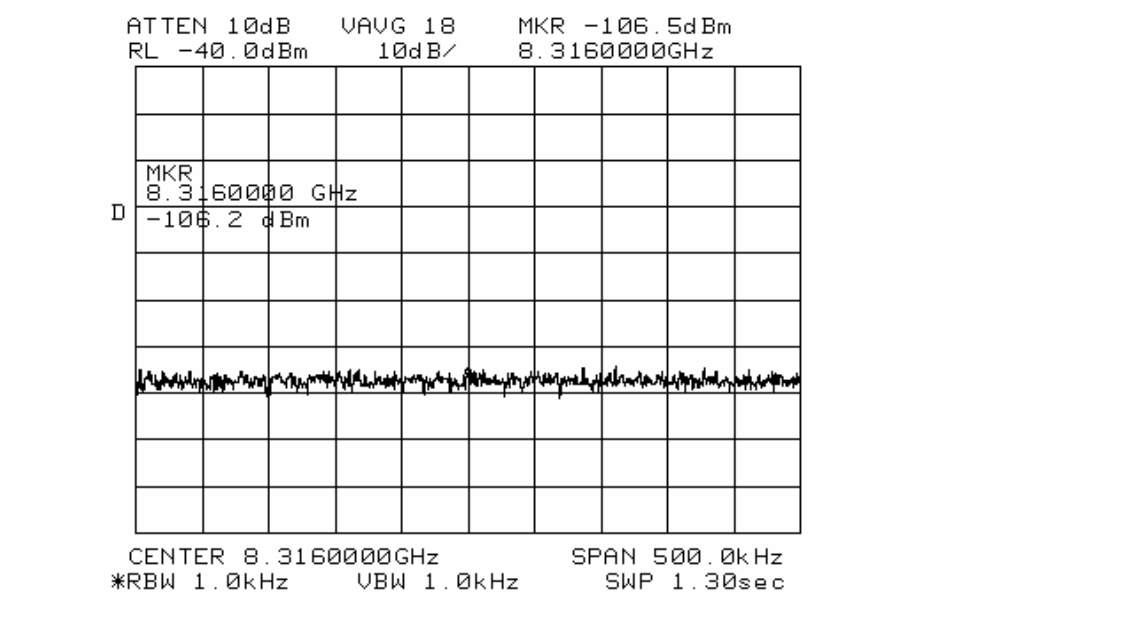
Plot 27: TX 7TH Harmonic, RBW = 1MHz



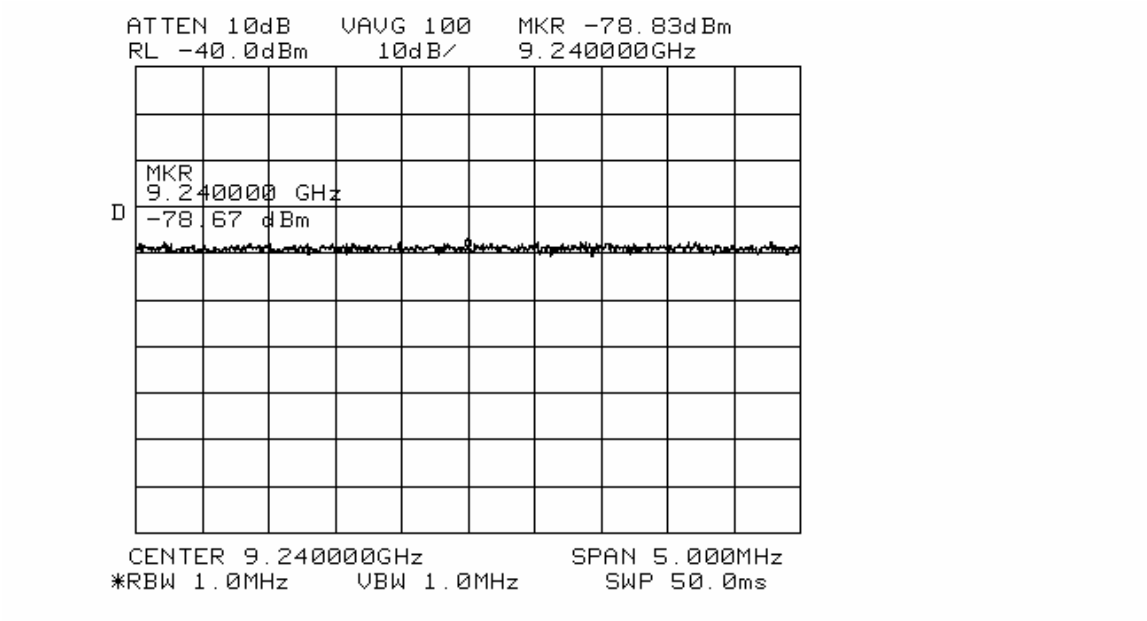
Plot 28: TX 8TH Harmonic, RBW = 1kHz



Plot 29: TX 9TH Harmonic, RBW = 1kHz



Plot 30: TX 10TH Harmonic, RBW = 1MHz



The results show that the radio with external antenna meets the FCC and RSS-210 limit of 500uV/m on the harmonics that fall in the restricted band.
Since the radio can be equipped with different antennas that have different gain, testing was done to determine the harmonic energy levels for the appropriate power out configuration. The spreadsheet summary is given below:

Open Field Emission Measurement Table for Canopy Model 9000										
900 MHz Radio	Tx Freq. tested	*Canadian and FCC restricted bands are in gray*								
	Fundamental	2nd Harmonic	3rd	4th	5th	6th	7th	8th	9th	10th
(TX) MHz	906	1812	2718	3624	4530	5436	6342	7248	8154	9060
(TX) MHz	915	1830	2745	3660	4575	5490	6405	7320	8235	9150
(TX) MHz	924	1848	2772	3696	4620	5544	6468	7392	8316	9240

A sample of the error budgeting is shown below. The total error is given in the last row, and shows that the error spread does not exceed +/- 2dB over the frequency range. Although not shown in the sample below, the error terms for the coax cable and the spectrum analyzer are included in the final error terms of the bottom row.

Measurement Error Budget	1-18GHz
Error Contribution (dB)	**EMCO 3115**
VSWR Contribution in dB	1.00
Amplitude Uncertainty (dB)	0.30
Reference Level	
Total Error, ±dB	***1.37***

For a confidence level of 68%, the error budget is then ±0.93dB.

The following Excel spreadsheet cells show the corrected power levels of the radio. The first sheet shows a maximum EIRP of +35.56 dBm ±0.93dB when the radio was operating at 906MHz, which is under the FCC limit of +36dBm for part 15.247 (3) devices.

Freq (MHz)	**906**	**915**	**924**
Radiated Pout of **Horizontally Polarized** Andrew Antenna	35.22	35.44	34.82
Radio Pout at board connector	23.24	23.01	22.79
Measured Ant Gain (dB)	**11.98**	**12.43**	**12.03**
Radiated Pout of **Vertically Polarized** Andrew Antenna	35.56	35.27	34.66
Radio Pout at board connector	23.24	23.01	22.79
Measured Ant Gain (dB)	**12.32**	**12.26**	**11.87**

TX Harmonics Summary

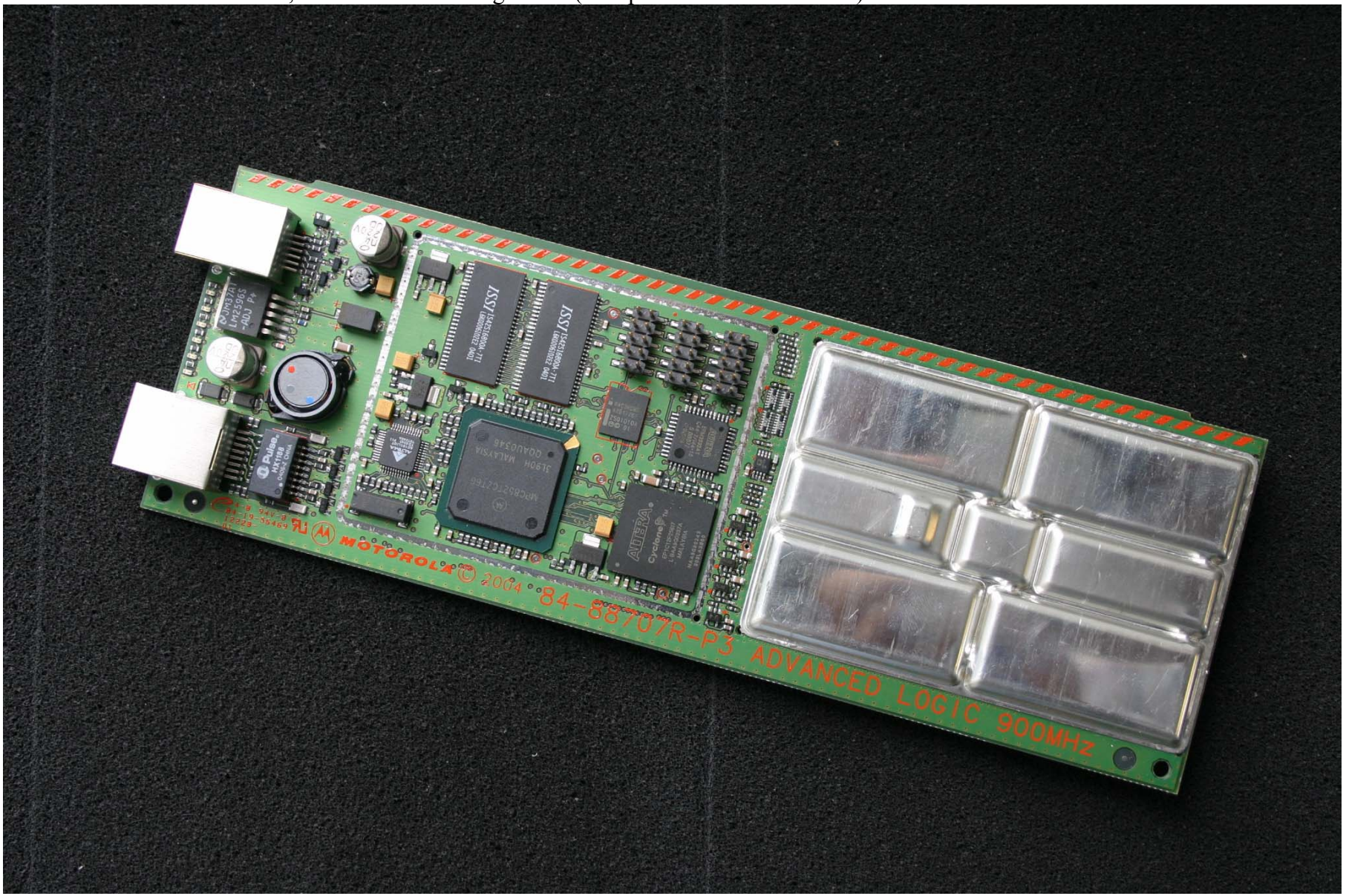
TX Mode	Frequency	Separation	SA Reading	Noise Floor	Adjusted SA Reading	Cable Loss	Antenna Gain	Antenna Factor	Path Loss	Power @Antenna	Power @ Ant Connector	E @ 3m	E @ 3m	Restricted Band Spec	Radio EIRP
	MHz	m	dBm	dBm	dBm	dB	dBi (4045)	dB/m (4045)	dB	dBm	dBm	dBuV/m	uV/m	uV/m @ 3m	dBm
Fund	906.0000	3.0	-13.83	-75.33	-13.83	12.89	4.62	24.72	-41.13	-5.56	-0.94	130.78	3460986.03	3640825.47	35.56
	915.0000	3.0	-14.17	-75.33	-14.17	12.89	4.66	24.76	-41.21	-5.94	-1.28	130.48	3341949.12	3640825.47	35.27
	924.0000	3.0	-14.83	-75.00	-14.83	12.89	4.70	24.80	-41.30	-6.64	-1.94	129.86	3110282.17	3640825.47	34.66
2nd	1812.0000	3.0	-76.83	-76.90	-94.79	13.48	7.30	27.96	-47.15	-88.61	-81.31	53.65	481.29	346086.47	-41.46
	1830.0000	3.0	-77.17	-77.20	-98.79	13.48	7.30	28.05	-47.23	-92.61	-85.31	49.74	306.84	346086.47	-45.38
	1848.0000	3.0	-78.17	-78.30	-93.47	13.48	7.30	28.14	-47.32	-87.29	-79.99	55.15	571.92	346086.47	-39.98
3rd	2718.0000	3.0	-102.5	-105.20	-105.84	13.98	7.84	31.05	-50.67	-99.71	-91.86	46.19	203.93	500.00	-49.04
	2745.0000	3.0	-107.8	-107.90	-124.23	13.98	7.85	31.14	-50.76	-118.10	-110.25	27.89	24.79	500.00	-67.34
	2772.0000	3.0	-103.5	-107.30	-105.84	13.98	7.85	31.22	-50.84	-99.72	-91.86	46.35	207.82	500.00	-48.88
4th	3624.0000	3.0	-112.5	-112.70	-125.97	14.35	8.08	33.32	-53.17	-119.69	-111.62	28.71	27.24	500.00	-66.52
	3660.0000	3.0	-112.3	-112.50	-125.77	14.35	8.07	33.42	-53.25	-119.49	-111.42	29.00	28.18	500.00	-66.23
	3696.0000	3.0	-114.2	-114.30	-130.63	14.35	8.06	33.51	-53.34	-124.34	-116.28	24.23	16.28	500.00	-71.00
5th	4530.0000	3.0	-113	-113.20	-126.47	14.70	9.29	34.07	-55.11	-121.06	-111.77	29.30	29.17	500.00	-65.95
	4575.0000	3.0	-114.5	-114.70	-127.97	14.70	9.27	34.17	-55.19	-122.54	-113.27	27.90	24.83	500.00	-67.35
	4620.0000	3.0	-113.8	-114.20	-124.36	14.70	9.25	34.26	-55.28	-118.91	-109.66	31.61	38.06	500.00	-63.63
6th	5436.0000	3.0	-113.5	-113.70	-126.97	15.05	9.27	35.62	-56.69	-121.19	-111.92	30.71	34.30	500.00	-64.50
	5490.0000	3.0	-83.83	-84.00	-97.99	15.05	9.30	35.69	-56.78	-92.23	-82.94	59.75	971.62	346086.47	-35.46
	5544.0000	3.0	-83.67	-84.00	-95.03	15.05	9.32	35.74	-56.86	-89.29	-79.98	62.77	1375.20	346086.47	-32.43
7th	6342.0000	3.0	-83.67	-83.80	-98.97	15.28	9.91	36.34	-58.03	-93.60	-83.69	59.64	959.79	346086.47	-35.57
	6405.0000	3.0	-84.83	-85.00	-98.99	15.28	9.99	36.36	-58.11	-93.69	-83.71	59.65	960.94	346086.47	-35.58
	6468.0000	3.0	-78.5	-78.67	-92.66	15.28	10.06	36.39	-58.20	-87.44	-77.38	66.01	1997.36	346086.47	-29.24
8th	7248.0000	3.0	-77.67	-77.80	-92.97	15.72	9.95	37.45	-59.19	-87.21	-77.25	67.19	2288.85	346086.47	-28.02
	7320.0000	3.0	-108.7	-108.80	-125.13	15.72	9.88	37.60	-59.27	-119.29	-109.41	35.20	57.52	500.00	-60.01
	7392.0000	3.0	-106.2	-106.30	-122.63	15.72	9.81	37.76	-59.36	-116.72	-106.91	37.85	78.11	500.00	-57.36
9th	8154.0000	3.0	-108.3	-108.40	-124.73	16.09	9.83	38.62	-60.21	-118.47	-108.64	36.99	70.68	500.00	-58.26
	8235.0000	3.0	-107.7	-108.20	-117.34	16.09	9.85	38.69	-60.30	-111.09	-101.25	44.44	166.77	500.00	-50.80
	8316.0000	3.0	-106.5	-106.70	-119.97	16.09	9.86	38.75	-60.38	-113.74	-103.88	41.88	124.10	500.00	-53.36
10th	9060.0000	3.0	-110.5	-110.70	-123.97	16.26	10.30	39.06	-61.13	-118.01	-107.71	38.35	82.73	500.00	-56.88
	9150.0000	3.0	-108.8	-108.90	-125.23	16.26	10.30	39.15	-61.21	-119.27	-108.97	37.18	72.30	500.00	-58.06
	9240.0000	3.0	-78.83	-79.00	-92.99	16.26	10.30	39.24	-61.30	-87.03	-76.73	69.51	2989.48	346086.47	-25.73

RX Harmonics Summary

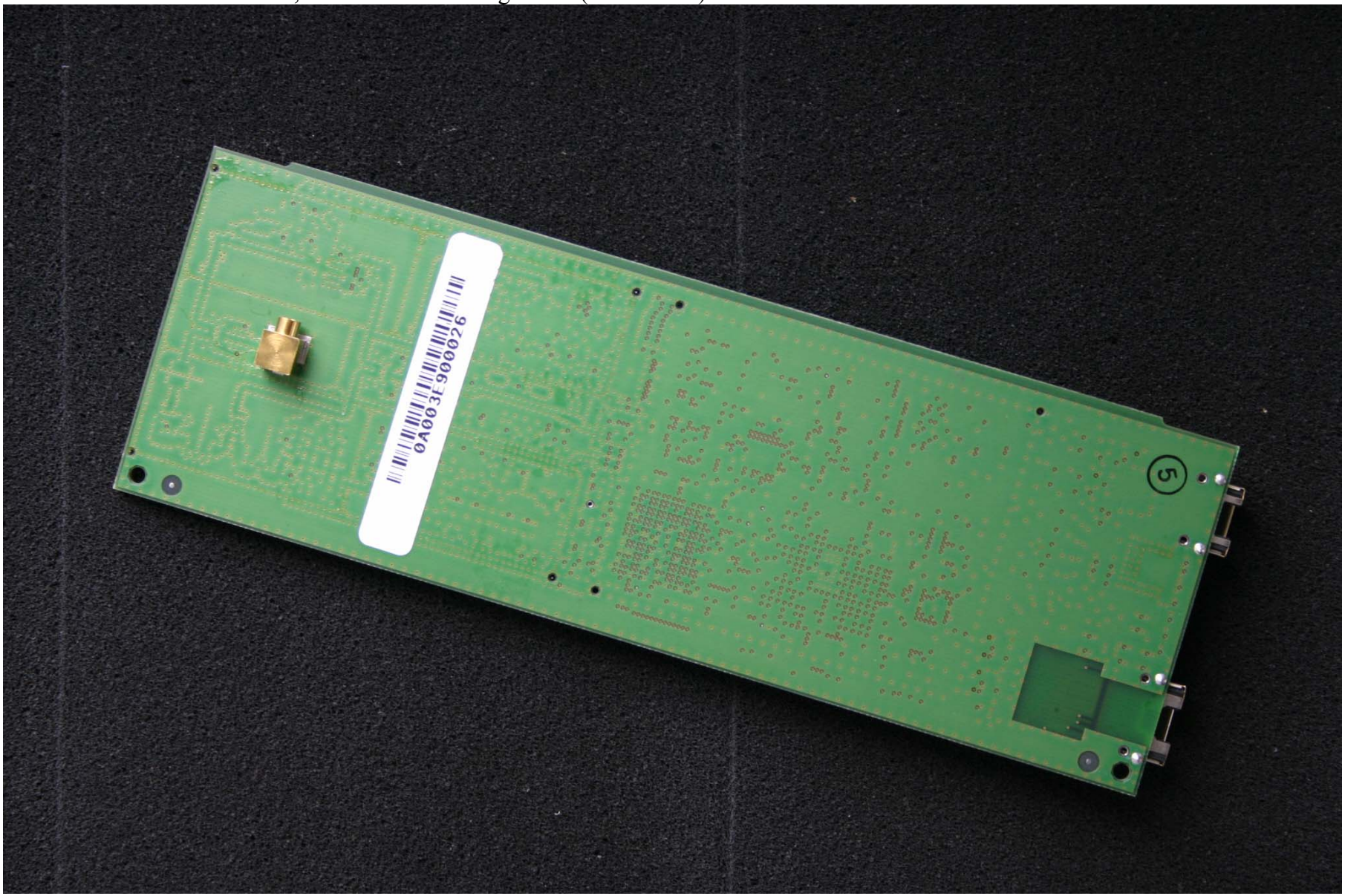
RX Mode	Frequency	Separation	SA Reading	Noise Floor	Adjusted SA Reading	Cable Loss	Antenna Gain	Antenna Factor	Path Loss	Power @Antenna	Power @ Ant Connector	E @ 3m	E @ 3m	Restricted Band Spec	Radio EIRP
	MHz	m	dBm	dBm	dBm	dB	dBi (4045)	dB/m (4045)	dB	dBm	dBm	dBuV/m	uV/m	uV/m @ 3m	dBm
Fund	976.0000	3.0	-108	-108.20	-121.47	12.96	5.01	24.95	-41.77	-113.52	-108.51	23.44	14.87	500.00	-71.74
	985.0000	3.0	-107.8	-108.00	-121.27	12.96	5.08	24.97	-41.85	-113.39	-108.31	23.66	15.25	500.00	-71.53
	994.0000	3.0	-108.3	-108.80	-117.94	12.96	5.15	24.99	-41.93	-110.13	-104.98	27.01	22.42	500.00	-68.20
2nd	1952.0000	3.0	-107.5	-107.70	-120.97	13.54	7.30	28.66	-47.79	-114.73	-107.43	28.23	25.80	500.00	-66.93
	1970.0000	3.0	-107.2	-107.30	-123.63	13.54	7.30	28.75	-47.87	-117.39	-110.09	25.66	19.19	500.00	-69.51
	1988.0000	3.0	-105.7	-106.00	-117.46	13.54	7.30	28.84	-47.95	-111.22	-103.92	31.92	39.46	500.00	-63.26
3rd	2928.0000	3.0	-110.8	-111.00	-124.27	14.03	7.89	31.68	-51.32	-118.12	-110.24	28.45	26.44	500.00	-66.81
	2955.0000	3.0	-113	-113.30	-124.76	14.03	7.89	31.77	-51.40	-118.62	-110.73	28.04	25.23	500.00	-67.22
	2982.0000	3.0	-111.7	-111.80	-128.13	14.03	7.90	31.85	-51.47	-121.99	-114.10	24.75	17.27	500.00	-70.52
4th	3904.0000	3.0	-111.7	-111.80	-128.13	14.48	8.02	34.05	-53.81	-121.67	-113.65	27.40	23.45	500.00	-67.85
	3940.0000	3.0	-111.8	-112.00	-125.27	14.48	8.01	34.14	-53.89	-118.80	-110.79	30.36	32.95	500.00	-64.91
	3976.0000	3.0	-110.3	-110.40	-126.73	14.48	8.00	34.24	-53.97	-120.25	-112.25	28.99	28.15	500.00	-66.28
5th	4880.0000	3.0	-111.8	-112.00	-125.27	14.83	9.15	34.84	-55.75	-119.59	-110.44	31.40	37.15	500.00	-63.83
	4925.0000	3.0	-114.2	-114.40	-127.67	14.83	9.13	34.94	-55.83	-121.97	-112.84	29.10	28.50	500.00	-66.13
	4970.0000	3.0	-113.5	-113.70	-126.97	14.83	9.11	35.03	-55.91	-121.25	-112.14	29.90	31.25	500.00	-65.34
6th	5856.0000	3.0	-111.3	-111.40	-127.73	15.18	9.44	36.06	-57.34	-121.99	-112.55	30.51	33.53	500.00	-64.65
	5910.0000	3.0	-113.8	-114.00	-127.27	15.18	9.46	36.11	-57.42	-121.55	-112.09	31.02	35.57	500.00	-64.14
	5964.0000	3.0	-112.3	-112.80	-121.94	15.18	9.49	36.16	-57.49	-116.24	-106.76	36.41	66.13	500.00	-58.75
7th	6832.0000	3.0	-108.8	-109.00	-122.27	15.56	10.17	36.73	-58.68	-116.87	-106.71	37.02	71.00	500.00	-58.20
	6895.0000	3.0	-107.3	-107.40	-123.73	15.56	10.18	36.80	-58.75	-118.35	-108.17	35.63	60.45	500.00	-59.59
	6958.0000	3.0	-107.2	-107.40	-120.67	15.56	10.19	36.86	-58.83	-115.30	-105.11	38.75	86.60	500.00	-56.46
8th	7808.0000	3.0	-107.7	-108.00	-119.46	15.96	9.76	38.31	-59.83	-113.26	-103.50	41.81	123.20	500.00	-53.42
	7880.0000	3.0	-108	-108.30	-119.76	15.96	9.78	38.38	-59.91	-113.57	-103.80	41.58	120.01	500.00	-53.66
	7952.0000	3.0	-109.8	-110.20	-120.36	15.96	9.79	38.45	-59.99	-114.19	-104.40	41.06	112.93	500.00	-54.19
9th	8784.0000	3.0	-111	-111.20	-124.47	16.29	10.13	38.96	-60.86	-118.30	-108.18	37.78	77.44	500.00	-57.45
	8865.0000	3.0	-111.5	-111.70	-124.97	16.29	10.19	38.97	-60.94	-118.87	-108.68	37.30	73.25	500.00	-57.93
	8946.0000	3.0	-108.8	-108.90	-125.23	16.29	10.26	38.99	-61.02	-119.19	-108.94	37.05	71.22	500.00	-58.18
10th	9760.0000	3.0	-108.3	-108.50	-121.77	16.63	10.30	39.71	-61.77	-115.44	-105.14	41.57	119.82	500.00	-53.66
	9850.0000	3.0	-107.5	-107.70	-120.97	16.63	10.30	39.78	-61.85	-114.64	-104.34	42.44	132.48	500.00	-52.78
	9940.0000	3.0	-108.8	-109.00	-122.27	16.63	10.30	39.85	-61.93	-115.94	-105.64	41.21	115.01	500.00	-54.01

Testing distance was 3 meters to insure far-field operation. Unit was rotated in both azimuth and elevation planes to find peak harmonic energy. The results show that the unit with externally attached antenna meets FCC limits for harmonic content for each model antenna.
The radiated results show that Canopy Model 9000 meets the FCC limits and RSS-210 Issue 5 of IC limits of 500uV/m on the Rx LO and Tx spurious frequencies. The worst case is in bold and is the 3rd harmonic of the VCO (2772MHz) and 10*LO. Note LO is the f_{VCO} +70MHz when in Receive.

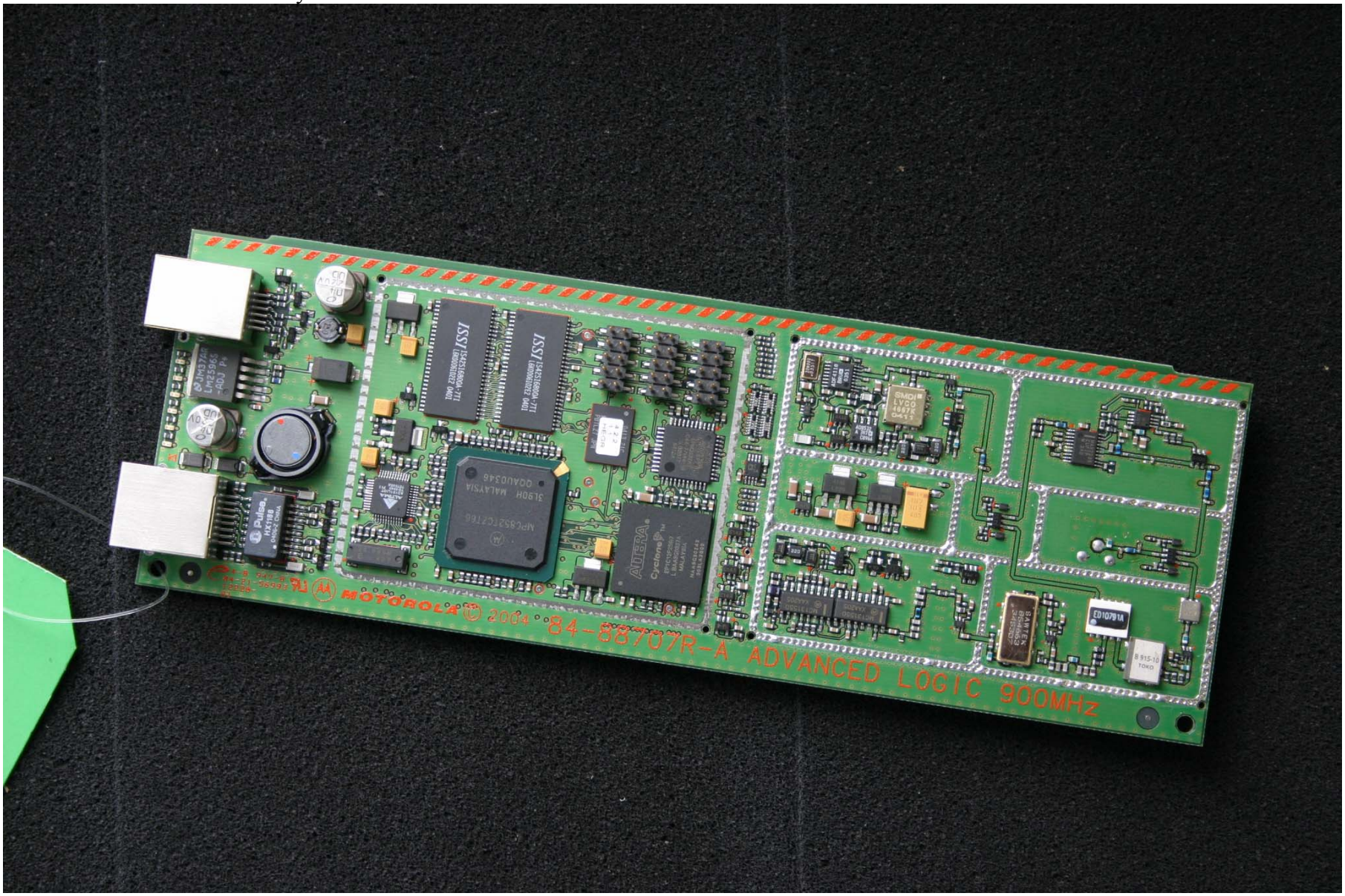
CANOPY unit #0A003E9026, Radio Printed Wiring Board (Component Side with Shield):



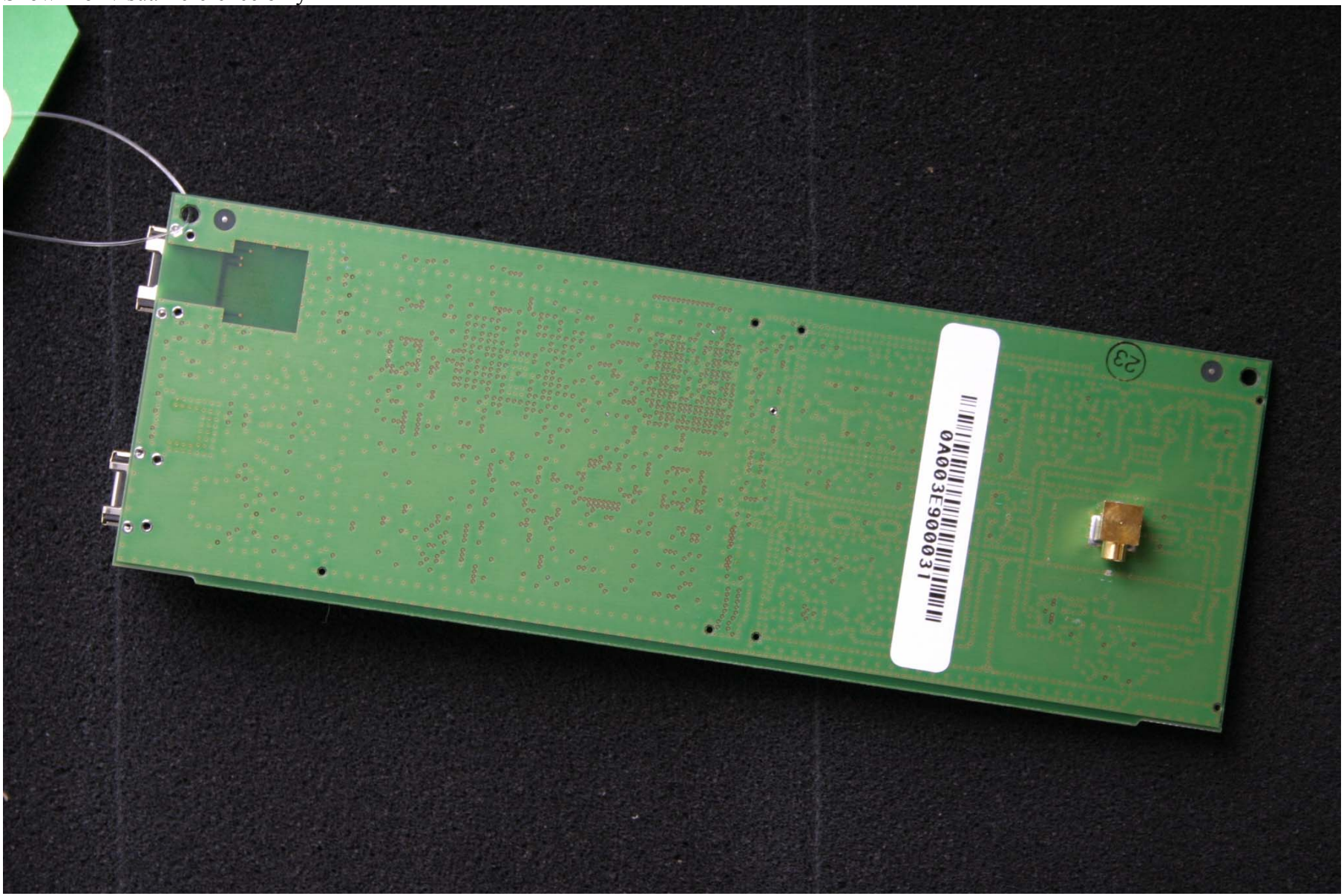
CANOPY Unit #0A003E9026, Radio Printed Wiring Board (Solder Side):



CANOPY unit #0A003E9031, Radio Printed Wiring Board (Component Side without Shield):
Shown for visual reference only



CANOPY unit #0A003E9031, Radio Printed Wiring Board (Component Side without Shield):
Shown for visual reference only



Andrew Vertically Polarized Antenna Views:

Front View

Side View1

Back View

Side View2