2.8 Occupied Bandwidth (FCC Section 2.1049)

EUT was modulated by a 2500 Hz signal. The bandwidth of the fundamental was measured by BK Radio, Inc. using a spectrum analyzer, as shown in Figure 5a through Figure 5b.

FCC Minimum Standard

FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only)
For any frequency removed from the center of the assigned channel by more than 50 percent up to and including 100 percent of the authorized bandwidth, at least 25 dB.

On any frequency removed from the center of the assigned channel by more than 100 percent up to and including 250 percent, at least 35 dB.

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$$43 + 10 \log (P_{Watts}) = 43 + 10 \log (53.0) = 60.2 \text{ dB}$$

The resolution bandwidth was 300 Hz or greater for measuring up to 250 kHz from the edge of the authorized frequency segment, and 30 kHz or greater for measuring more than 250 kHz from the authorized frequency segment.

FCC Part 90.210 (12.5 kHz Bandwidth only)
For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0 dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d - 2.88 kHz) dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

$$50 + 10 \log (P_{Watts}) = 50 + 10 \log (53.0) = 67.2 \text{ dB}$$

Figure 5a.
Occupied Bandwidth (Wide Bandwidth)

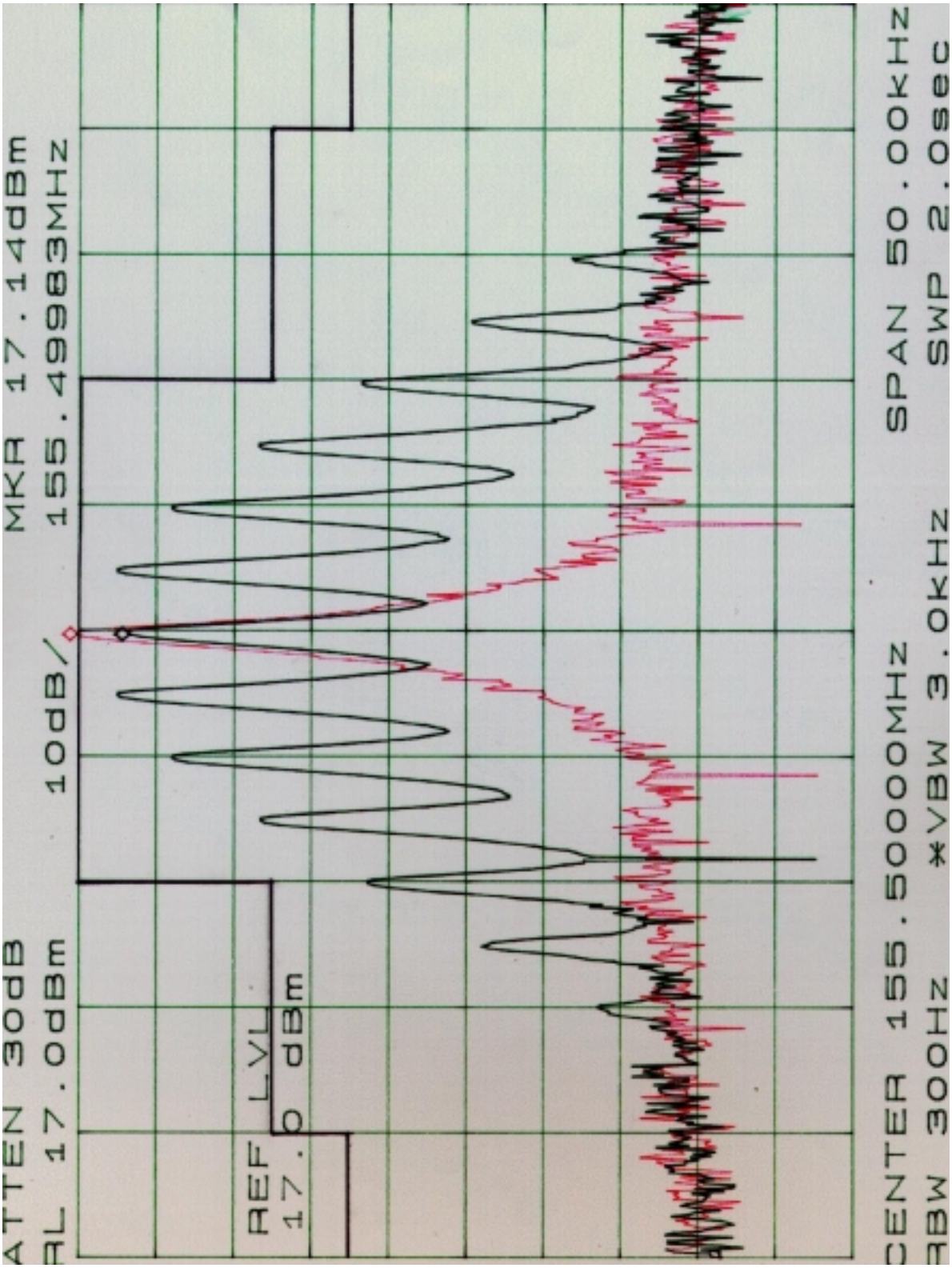
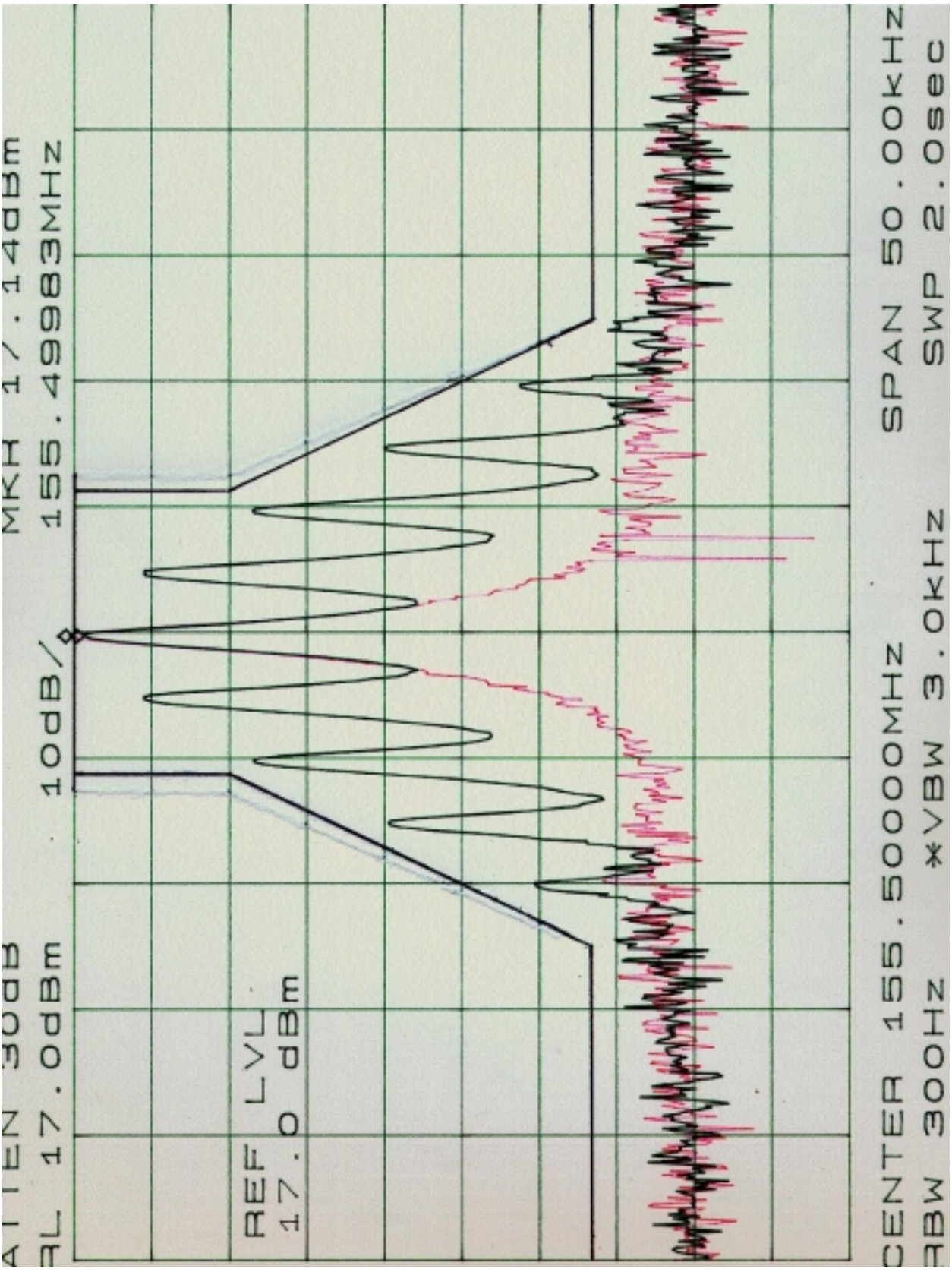


Figure 5b.
Occupied Bandwidth (Narrow Bandwidth)



2.9 Spurious Emissions at Antenna Terminals (FCC Section 2.1051)

Spurious emissions appearing at the antenna terminals were measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. Results are shown in Figure 6.

FCC Minimum Standard

FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only)

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$$43 + 10 \log (P_{Watts}) = 43 + 10 \log (53.0) = 60.2 \text{ dB}$$

FCC Part 90.210 (12.5 kHz Bandwidth only)

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

$$50 + 10 \log (P_{Watts}) = 50 + 10 \log (53.0) = 67.2 \text{ dB}$$

NOTE: In General, the worse case attenuation requirement shown above was applied.

Figure 6a
Spurious Emissions at Antenna Terminals

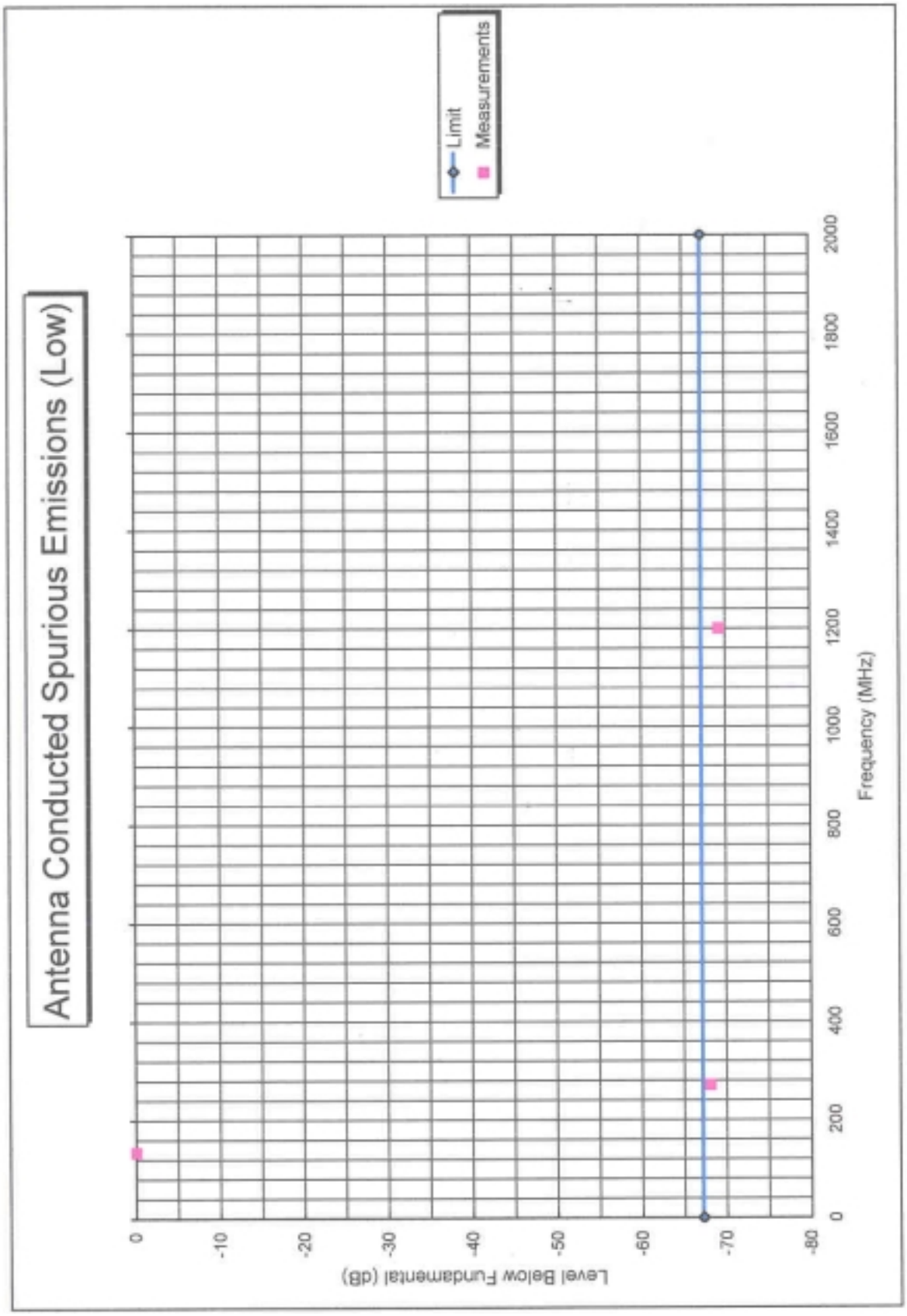

Antenna Conducted Spurious Emissions (Low)
Limit
Measurements
Level Below Fundamental (dB)
0
-10
-20
-30
-40
-50
-60
-70
-80
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Frequency (MHz)

Figure 6b
Spurious Emissions at Antenna Terminals

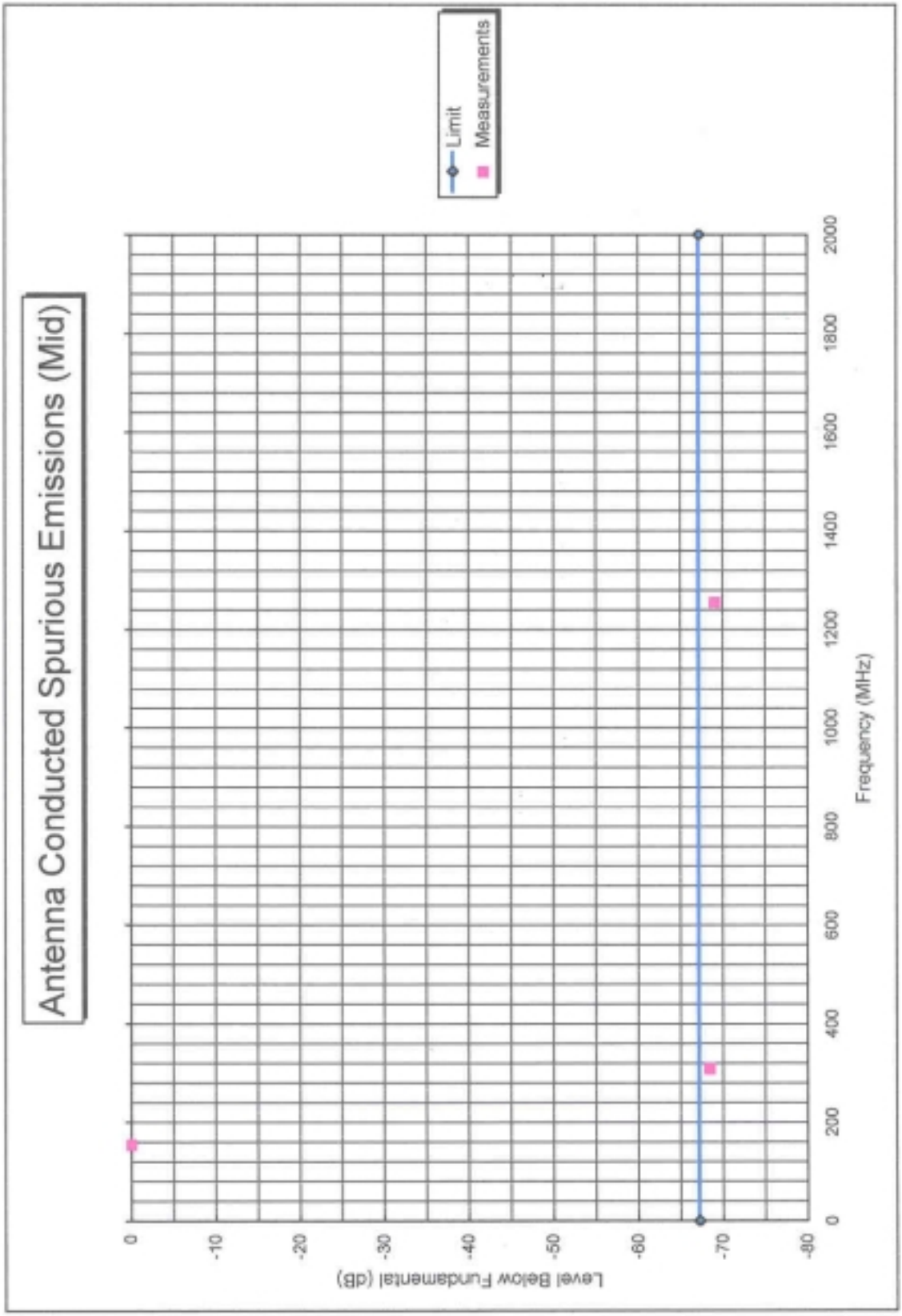
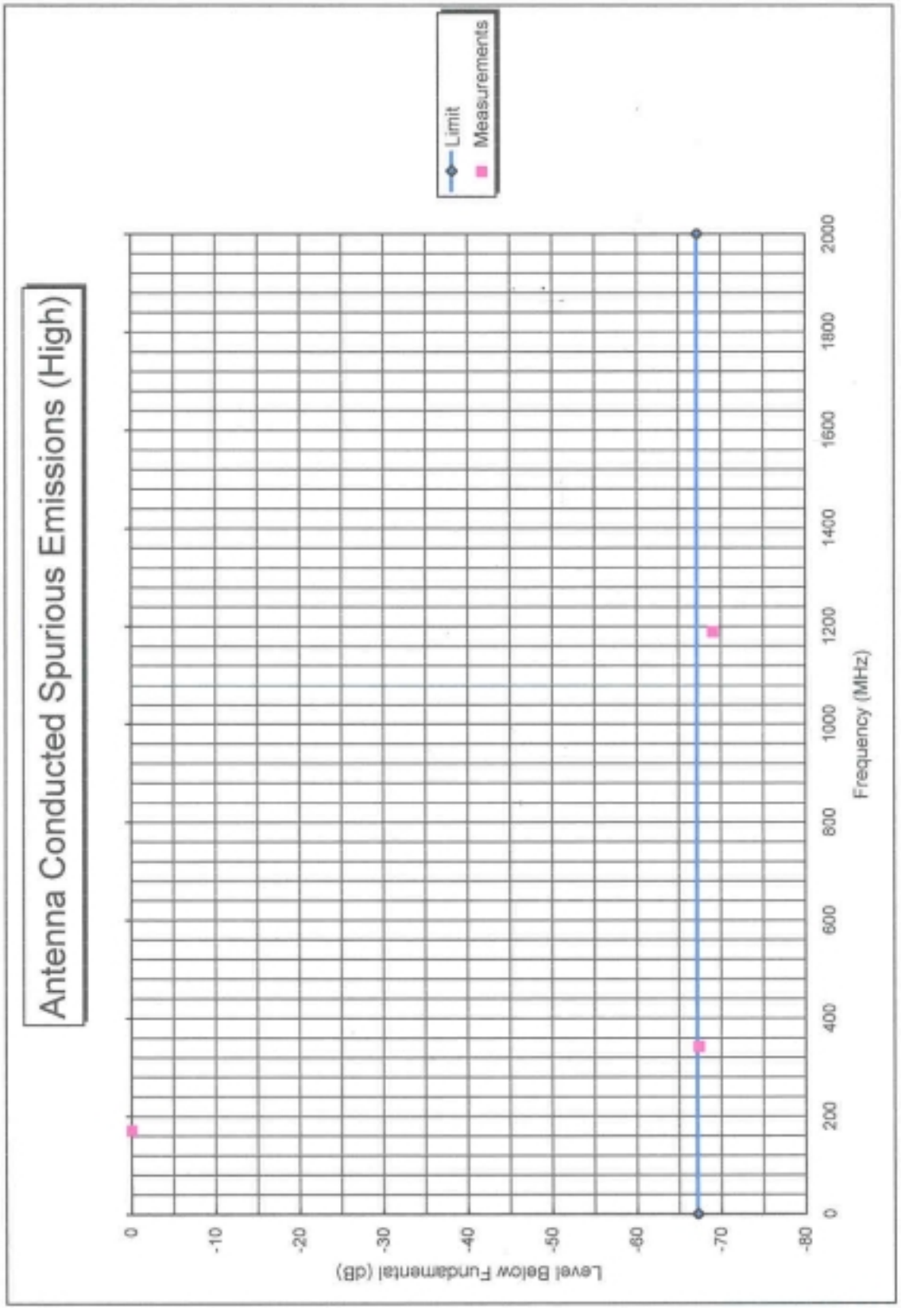


Figure 6c
Spurious Emissions at Antenna Terminals



2.10 Field Strength of Spurious Radiation (FCC Section 2.1053)

Spurious emissions were evaluated from 30 MHz to 2.0 GHz at an EUT to antenna distance of 3 meters. The EUT was tested with a new battery. Measurements for 30 to 1000 MHz were made with the analyzer's bandwidth set to 120 kHz. Measurements above 1 GHz were made with the analyzer's bandwidth set to 1 MHz. Results are shown in Table 4. Following is an example of how the data was calculated.

The spurious radiation measured is interpolated to 30 meters using:

dBm @ 3 meters + 20 log(3/30) = dBm @ 30 meters

this level is compared to the level a transmitter would produce at 30 meters if connected to a 1/2 wave dipole using:

$$E = \frac{(30\ P_t\ G_t)^{1/2}}{d} \text{ volts per meter}$$

E = Field intensity (volts per meter)

P_t = Power output of transmitter (watts)

G_t = Gain of antenna (1.64 for 1/2 wave dipole)

d = distance (meters)

For Example: A 25 watt transmitter would produce

$$\frac{[(30)(25)(1.64)]^{1/2}}{30.0} \text{ volts per meter}$$

= 1,150,635 microvolts per meter @ 30 meters

FCC Minimum Standard

FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only)

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

LOW : 43 + 10 log (P_{Watts}) = 43 + 10 log (54.7) = 60.3 dB
MID : 43 + 10 log (P_{Watts}) = 43 + 10 log (53.0) = 60.2 dB
HIGH : 43 + 10 log (P_{Watts}) = 43 + 10 log (54.6) = 60.3 dB

FCC Part 90.210 (12.5 kHz Bandwidth only)

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

LOW: 50 + 10 log (P_{Watts}) = 50 + 10 log (54.7) = 67.4 dB
MID : 50 + 10 log (P_{Watts}) = 50 + 10 log (53.0) = 67.2 dB
HIGH: 50 + 10 log (P_{Watts}) = 50 + 10 log (54.6) = 67.4 dB

NOTE: In General, the worse case attenuation requirement shown above was applied.

FIELD STRENGTH OF SPURIOUS RADIATION

Test Date: April 16, 2000 - April 23, 2000
UST Project: 00-0141
Customer: BK Radio, Inc.
Model: GMH 5992X

FCC Minimum Standard: 50 + 10 log (54.7) = 67.4 dB
Fundamental = Corrected Reading in Far Field (30m) = +17.6 dBm

TABLE 4a

FREQ (MHz)	MEASUREMENT @ 3 m (dBm)	CORRECTION AF + CL + AMP GAIN	CORRECTED MEASUREMENT @ 30 m (dBm)	ATTENUATED LEVEL BELOW CARRIER POWER (dB)
272.6	-51.1	17.3	-53.8	71.4
408.9	-59.7	20.6	-59.1	76.7
545.2	-65.4	23.7	-61.7	76.6
1090.4	-50.9	-7.9	-78.8	96.4
1499.7	-47.0	-5.6	-72.6	90.2

SAMPLE CALCULATION:
Results dBm @ 30 m:
-51.1 + 17.3 - 20 = -53.8

CONVERSION FROM 3m to 30m = 20 log (3/30) = -20 dBm

Test Results
Reviewed By: _____ **Name:** Tim R. Johnson

FIELD STRENGTH OF SPURIOUS RADIATION

Test Date: April 16, 2000 - April 23, 2000
UST Project: 00-0141
Customer: BK Radio, Inc.
Model: GMH 5992X

FCC Minimum Standard: 50 + 10 log (53.0) = 67.2 dB
Fundamental = Corrected Reading in Far Field (30m) = +16.9 dBm

TABLE 4b

FREQ (MHz)	MEASUREMENT @ 3 m (dBm)	CORRECTION AF + CL + AMP GAIN	CORRECTED MEASUREMENT @ 30 m (dBm)	ATTENUATED LEVEL BELOW CARRIER POWER (dB)
311.0	-72.3	18.6	-73.7	90.6
466.5	-64.7	22.1	-62.6	79.5
933.0	-79.1	31.1	-68.0	84.9
1088.5	-50.2	-8.2	-78.4	95.3
1555.0	-48.6	-5.1	-73.7	90.6

SAMPLE CALCULATION:
Results dBm @ 30 m:
-72.3 + 18.6 - 20 = -73.7

CONVERSION FROM 3m to 30m = 20 log (3/30) = -20 dBm

Test Results
Reviewed By: _____ **Name:** Tim R. Johnson

FIELD STRENGTH OF SPURIOUS RADIATION

Test Date: April 16, 2000 - April 23, 2000
UST Project: 00-0141
Customer: BK Radio, Inc.
Model: GMH 5992X

FCC Minimum Standard: 50 + 10 log (54.6) = 67.4 dB
Fundamental = Corrected Reading in Far Field (30m) = +17.7dBm

TABLE 4c

FREQ (MHz)	MEASUREMENT @ 3 m (dBm)	CORRECTION AF + CL + AMP GAIN	CORRECTED MEASUREMENT @ 30 m (dBm)	ATTENUATED LEVEL BELOW CARRIER POWER (dB)
347.6	-72.8	19.4	-72.9	90.6
521.4	-75.1	23.4	-71.7	89.4
695.2	-78.3	27.4	-70.9	88.6
869.0	-73.9	30.0	-63.9	81.6
1043.8	-47.6	-8.2	-75.8	93.5
1390.3	-47.7	-6.2	-73.9	91.6

SAMPLE CALCULATION:

Results dBm @ 30 m:
-72.8 + 19.4 - 20 = -72.9

CONVERSION FROM 3m to 30m = 20 log (3/30) = -20 dBm

Test Results
Reviewed By: _____ **Name:** Tim R. Johnson

2.11 Frequency Stability (FCC Section 2.1055)

The frequency tolerance of the carrier signal was measured by while ambient temperature was varied from -30 to 50 degrees centigrade. The frequency tolerance was verified at 10 degree increments. The EUT was tested while powered from 13.6 VDC. Additionally, the supply voltage was varied from 85% to 115% of the nominal value (except for hand carried, battery powered equipment which was additionally measured at battery endpoint). The data is shown in the following tables and figures.

FCC Minimum Standard

FCC Part 22.355
5.0 ppm for Mobile > 3 Watts

FCC Part 74.464
0.0005% (5 ppm) for > 3 Watts

FCC Part 80.209
5.0 ppm for Coast Stations > 3 Watts

FCC Part 90.213
5.0 ppm for > 2 Watts

FCC Certification
BK Radio, Inc. Model GMH 5992X
Frequency Stability vs. Temperature (At Startup)

FCC ID: K95GMH599

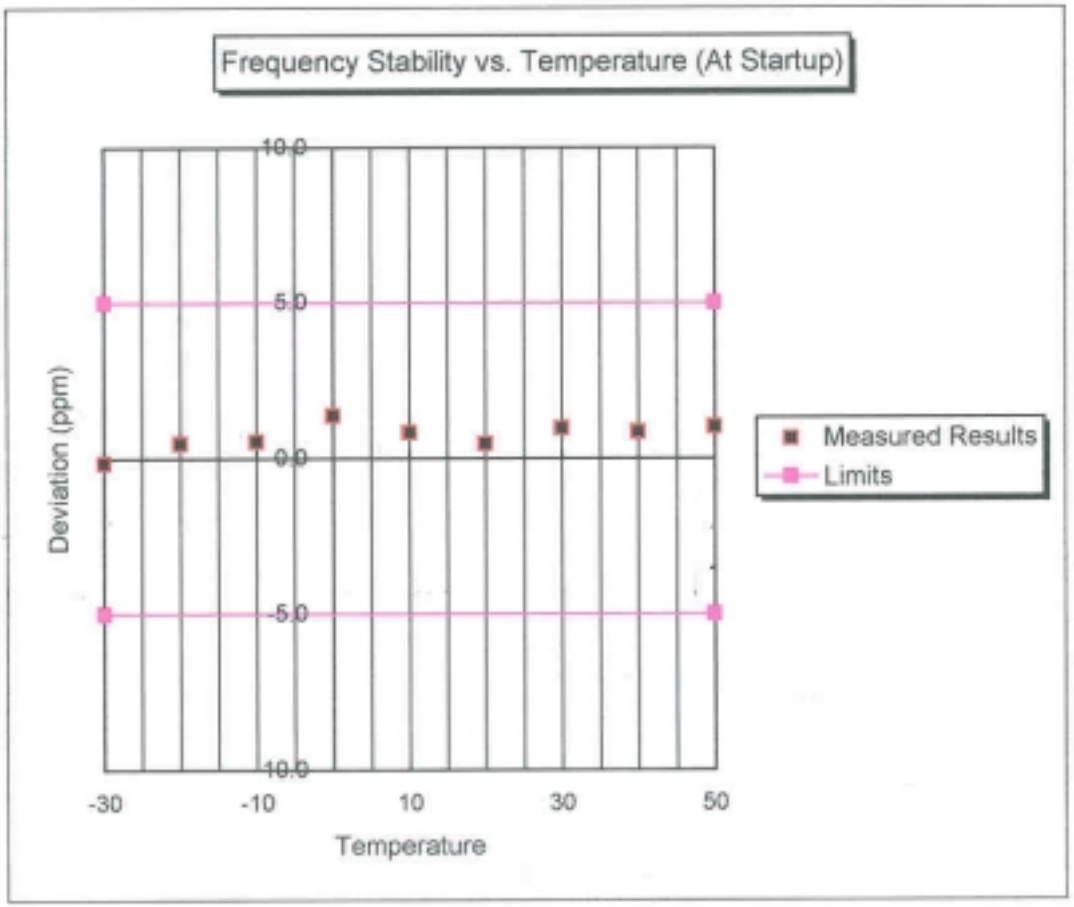
Test Results Reviewed By:

Tim Johnson
NARTE Certified Engineer
No. EMC-002205-NE

Temperature (degrees C)	Measured Frequency (MHz)	Deviation (ppm)
-30	136.299977	-0.2
-20	136.300064	0.5
-10	136.300073	0.5
0	136.300187	1.4
10	136.300113	0.8
20	136.300064	0.5
30	136.300131	1.0
40	136.300115	0.8
50	136.300137	1.0

Actual TX Frequency was: 136.300 MHz

Maximum Deviation = 5 ppm



FCC ID: K95GMH599

FCC Certification

FCC ID: K95GMH599

BK Radio, Inc. Model GMH 5992X

Frequency Stability vs. Temperature (2 Minutes After Startup)

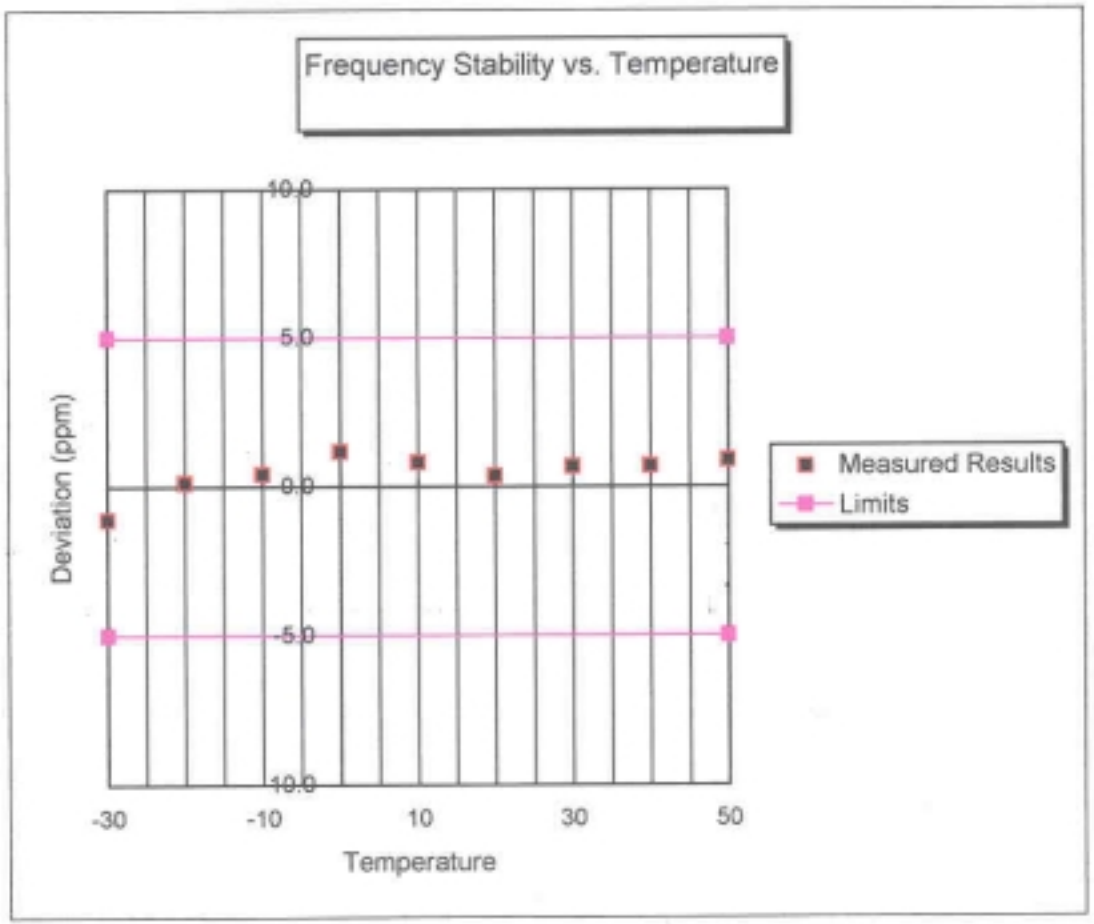
Test Results Reviewed By:

Tim Johnson
NARTE Certified Engineer
No. EMC-002205-NE

Temperature (degrees C)	Measured Frequency (MHz)	Deviation (ppm)
-30	136.299849	-1.1
-20	136.300016	0.1
-10	136.300057	0.4
0	136.300159	1.2
10	136.300111	0.8
20	136.300048	0.4
30	136.300091	0.7
40	136.300093	0.7
50	136.300121	0.9

Actual TX Frequency was: 136.300 MHz

Maximum Deviation = 5 ppm



FCC ID: K95GMH599

FCC Certification
BK Radio, Inc. Model GMH 5992X
Frequency Stability vs. Temperature (5 Minutes After Startup)

FCC ID: K95GMH599

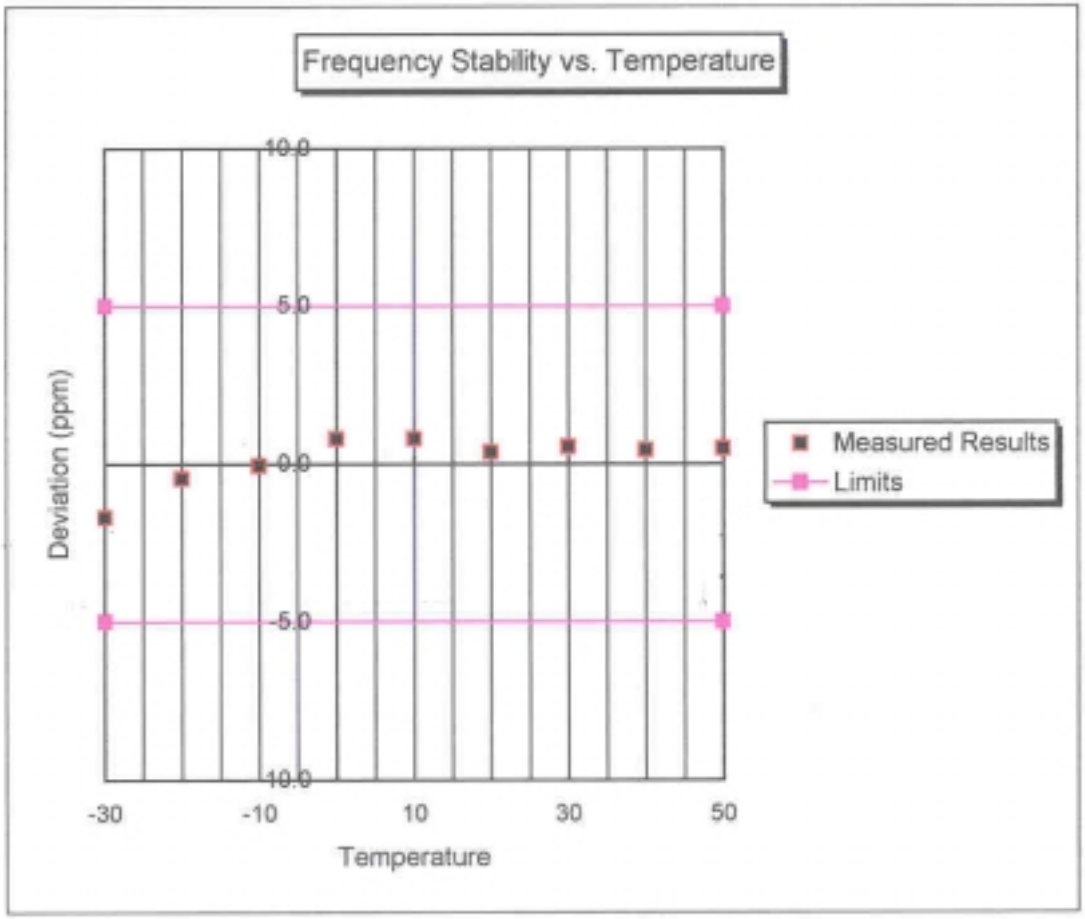
Test Results Reviewed By:

Tim Johnson
NARTE Certified Engineer
No. EMC-002205-NE

Temperature (degrees C)	Measured Frequency (MHz)	Deviation (ppm)
-30	136.299769	-1.7
-20	136.299937	-0.5
-10	136.299991	-0.1
0	136.300107	0.8
10	136.300107	0.8
20	136.300050	0.4
30	136.300073	0.5
40	136.300059	0.4
50	136.300065	0.5

Actual TX Frequency was: 136.300 MHz

Maximum Deviation = 5 ppm



FCC Certification

FCC ID: K95GMH599

BK Radio, Inc. Model GMH 5992X

Frequency Stability vs. Temperature (10 Minutes After Startup)

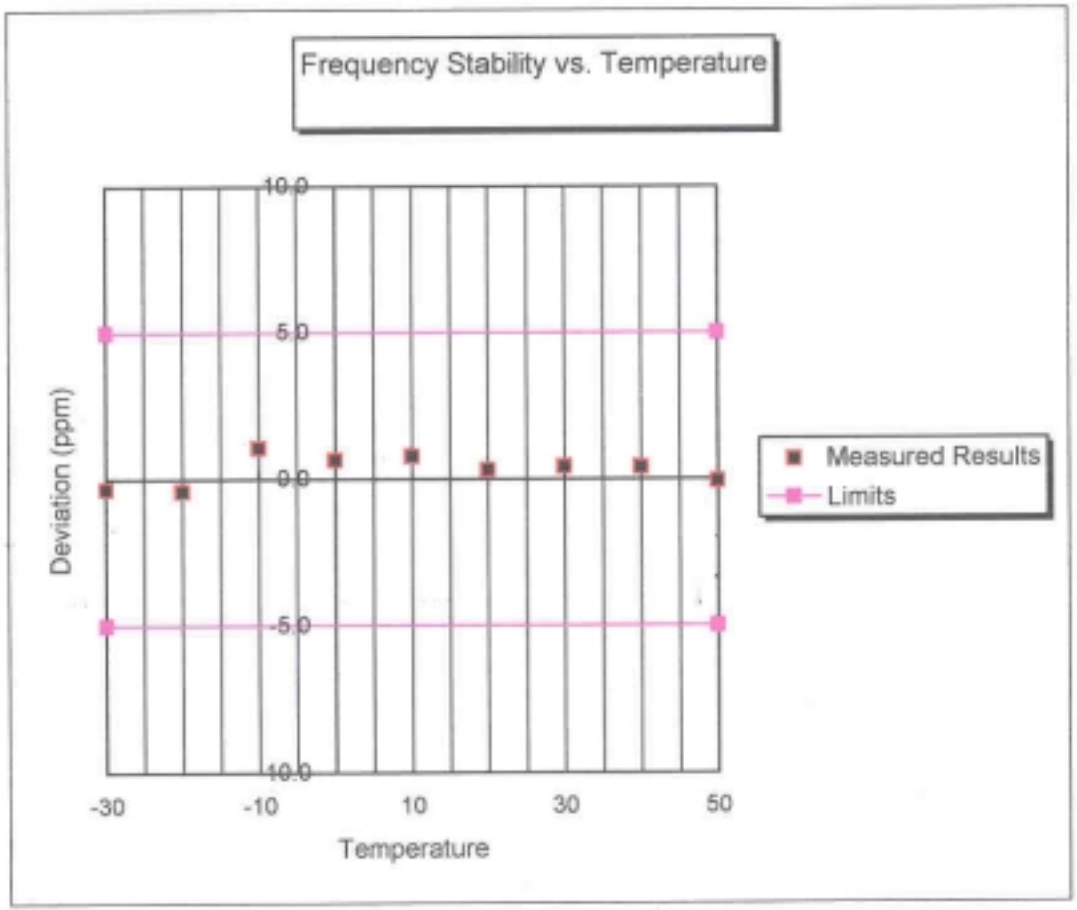
Test Results Reviewed By:

Tim Johnson
NARTE Certified Engineer
No. EMC-002205-NE

Temperature (degrees C)	Measured Frequency (MHz)	Deviation (ppm)
-30	136.299953	-0.3
-20	136.299943	-0.4
-10	136.300145	1.1
0	136.300089	0.7
10	136.300105	0.8
20	136.300042	0.3
30	136.300057	0.4
40	136.300053	0.4
50	136.299989	-0.1

Actual TX Frequency was: 136.300 MHz

Maximum Deviation = 5 ppm



FCC ID: K95GMH599

FCC Certification
BK Radio, Inc. Model GMH 5992X
Frequency Stability vs. Voltage

FCC ID: K95GMH599

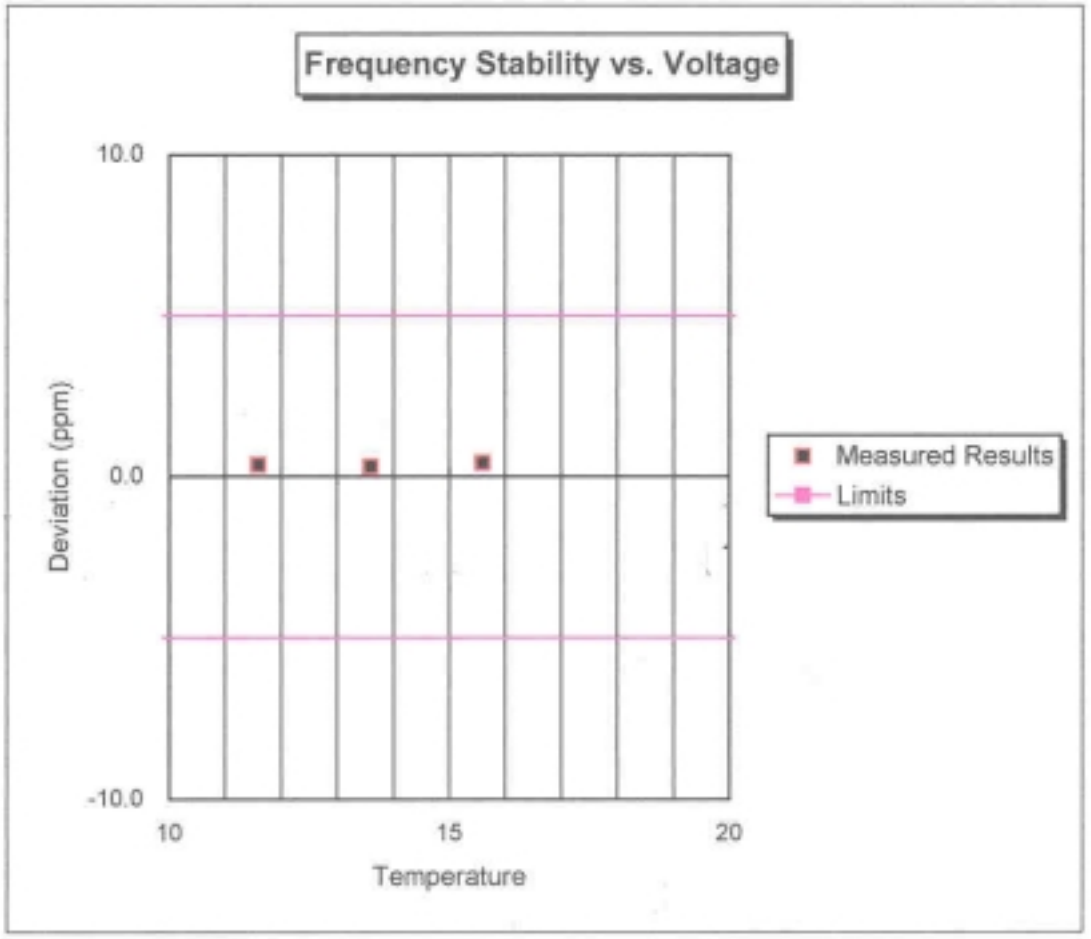
Test Results Reviewed By:

Tim Johnson
NARTE Certified Engineer

Voltage (V DC)	Measured Frequency (MHz)	Deviation (ppm)
15.6	136.3001	0.4
13.6	136.3000	0.3
11.6	136.3000	0.4

Actual TX Frequency was: 136.300 MHz

Maximum Deviation = 5 ppm



FCC ID: K95GMH599